

ESSAYS

RELATING TO

AGRICULTURE

AND

RURAL AFFAIRS.

ESSAYS

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AGRICULTURE



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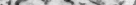
BY

JAMES ANDERSON,
FARMER AT MONKS-HILL, ABERDEENSHIRE.

In omnibus rebus, et maxime physicis, quid non fit, citius
quam quid fit, dixerim. CICERO.

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JAMES ANDERSON

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P R E F A C E.

THE following Essay is a very inconsiderable fragment of a much larger work, in which the author had made but small progress, when the event mentioned in the introductory advertisement put a stop to the farther prosecution of it. And, as it is possible that he may never have leisure, or be in such a situation as to enable him to finish that work as he at first intended, he has been prevailed upon by his Bookseller to offer it to the public in its present imperfect state, hoping that, even in this imperfect state, it may be of some use in directing the attention of future enquirers to proper objects.—To contribute farther towards
that

that end, the following short account is given of the author's design, and the motives that originally induced him to engage in this undertaking.

From particular circumstances, nowise interesting to the reader, he was necessarily engaged in the practice of Agriculture at a very early period of life; and being naturally delighted with the innocent pleasures which that mode of life presented to an ingenuous mind, he engaged in the study of it with an ardour natural to the impetuosity of youth. By consulting such authors on this subject as fell in his way, he soon found himself deeply involved in intricate physical discussions about the *pabulum* of plants,—the influence of salts, oils, acids, and many other such like substances, of which he could form but a very vague and indeterminate idea, so as not to be able with certainty to perceive the full force of such arguments as were adduced by these authors in support of their favourite hypotheses. And, being unwilling to be instructed by halves, or to take the word of any author as a *demonstration* of the proposition that he assumed; he applied himself with diligence to acquire a knowledge of those

those sciences that seemed necessary to be attained before he could peruse these authors with profit.

But, instead of reaping the benefit from thence that he had at first expected, he had the mortification to find, that almost all these writers were equally ignorant of the real qualities of the substances whose names they employed, as he himself had been; and that each having formed in his own mind a vague and indeterminate idea of some imaginary substance, endowed with as imaginary qualities, modelled by his fancy, so as exactly to suit the hypothesis he had assumed, gave to it the name of *salt*, *oil*, *acid*, or any other that chanced first to occur to his imagination, and then employed it on all occasions to explain every difficulty that might occur with regard to the theory or practice of Agriculture.

And as they, for the most part, argued with a degree of confidence exactly proportioned to their own ignorance, he found that the influence of these empirical theorists had extended so far, as to infest the minds of sober practical farmers to such a degree, as to render
them,

them, in many cases, incapable of drawing impartial conclusions from the observations that their own experience might have afforded, and thus prevented them from writing intelligibly on almost any practical subject, they being constantly desirous of adapting facts to their own whimsical and absurd theories.

Tired, at length, with repeated fruitless endeavours to attain useful knowledge in this way, and disgusted with the nonsensical jargon that he was obliged to read, he, in a sort of literary apathy, threw aside his books, and resolved to disengage his mind from theoretical reasoning as much as possible, and, with unprejudiced sincerity of intention, attend to practice alone, as the only sure mode of instruction.

As he was thus, in some measure, obliged to retire, as it were, within himself for instruction, and to meditate upon the most effectual means of attaining it, he soon perceived, that, as a vague and inaccurate mode of reasoning had been too freely admitted into this science, in consequence of which conclusions were frequently drawn from premises that could not
have

have been authorized by any accurate mode of induction; it behoved a farmer, who wished to make any solid attainments in useful knowledge, first of all to accustom himself to an accurate mathematical mode of reasoning, so as carefully to distinguish between the *essential* and *accidental* circumstances that might on any occasion tend to vary the result of any experiment, and constantly guard against admitting any thing as a fact upon which any future reasoning should be erected, until it had been previously examined with the most scrupulous attention, and demonstrated to be such.

But, when he began to apply this rule steadily in examining into the truth of those facts, usually admitted as axioms * into this science, it is difficult to describe the disappointment that he met with; when, instead of that certainty he hoped for, and upon which he had, on many occasions, formerly relied, he found

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himself

* Axiom in mathematics is a term employed to denote those self-evident truths that are so obvious to the understanding, as to be readily recognised as such without any sort of demonstration; and, therefore, serve as a basis upon which other demonstrations may be erected.---Such as a part is not so great as the whole, &c.

himself involved in doubtful obscurity. And it was not without amazement, that he perceived how very little was, with certainty, known in an art so absolutely necessary to the well being of mankind. Nor does he imagine that any one, who has not with attention examined it in this point of view, could think it possible that an art that has been practised for so many ages by all civilized nations, should be still involved in such great uncertainty in almost every particular, as it will be found to be.

This being the case, it was obvious that materials for forming any rational theory of this art were so very scanty, that little else but hypothetical conjecture could be expected in that way, until facts were more accurately authenticated. And, as he is sensible that it requires an uncommonly philosophical turn of mind, and cultivated understanding, to be able to select with judgment such leading facts as might serve as a basis to an infant theory, or to make such experiments as might be decisive in this point of view, he would wish to turn the attention of the farmer altogether from these pursuits; and allowing the man of science to study it as a science, he means to content himself with
viewing

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viewing it as an œconomical art, on the proper knowledge of which, as such, the prosperity and happiness of numbers of his fellow-creatures materially depends. And, happy he will deem himself, if his efforts in this way shall be attended with success.

Leaving, therefore, the philosopher to pursue his sublime speculations, and, proceeding in the more humble walk to which he had confined himself, it readily occurred, that, as those who practise agriculture are usually confined to a particular spot, their observations must necessarily be confined to those few objects that come within their own narrow sphere. And, as their attention is usually employed in cultivating such plants, or rearing such animals, or prosecuting such a mode of culture as chance may have recommended to their notice, without being acquainted with all the varieties of these that may be met with in different parts of the earth, or knowing the cases in which others might be substituted instead of these with advantage; they are thus, in a great many cases, ignorant of what might be done for their own emolument, nor know how to make the greatest advantage of their own

b 2
particular

particular situation ; so that, not being sensible of their real wants, they remain contented with what they only in some measure know, without making those efforts, which, if properly directed, must naturally tend very much to improve that art which they practise.

In these circumstances, he imagined that nothing could promise to be of more real utility to the practical farmer, than a work that was calculated to present to him a concise view of all those objects that might demand his attention, when he should be so circumstanced as to have any particular object principally in view ; that, by thus having at all times before his eyes, a distinct view of all the circumstances that could affect him, he might be in no danger of overlooking any of them ; and, by thus having some fixed object continually in his eye, he might be enabled to advance with some degree of certainty, instead of pursuing that devious and desultory course, to which he is, in the present situation of affairs, so much exposed.

In pursuing these disquisitions, he imagined, that, as the proper business of the farmer may be said to consist in rearing such crops as may
be

be useful to man, and, in managing or disposing of these, so as that they might turn out to the greatest benefit to himself, and good to the public, the whole of the objects that could lay claim to his attention might properly be reduced to the three following general heads, viz.

1st, The knowledge of the different properties of all the plants that can be raised by the farmer;—the different uses to which these can be in any case applied; and the most economical method of consuming, or otherwise disposing of them.

2^d, The knowledge of the nature and distinguishing qualities of the different animals that may be kept for carrying on the various operations of Agriculture, and of those that are reared for the purpose of consuming these plants; and the proper method of treating the different varieties of them, so as to make any one kind of food, on all occasions, produce the greatest possible effect. And,

3^d, The knowledge of soils; the way of manuring and cultivating these, so as best to fit them

them for rearing such valuable plants as it may be most beneficial for the farmer to rear. For,

Unless a man is acquainted with *all* the plants that can be reared in his soil or climate, and with *all* the distinguishing qualities and peculiar properties * of each, so as to know with certainty in what circumstances any one of these could be raised to the greatest perfection, and for what purposes they could be most oeconomically employed, he cannot be said to have attained a perfect knowledge of rural oeconomics †.

Unless

* This passage has somewhat the appearance of a tautology, or unmeaning amplification, that the author knew not how to avoid. By *distinguishing qualities*, he would wish to denote those peculiarities that are often remarked in the manner of growth, time of vegetating, &c. of plants; and, by *peculiar properties*, he would be understood to mean, the medical qualities, if he may use that expression, or those qualities by which they are fitted to affect the animal oeconomy, when consumed by any living creature. The meaning of this distinction will be more obvious from many passages in the following disquisitions.

† I have here ventured to adopt a term from a foreign language,

Unless a man is acquainted with *all* the animals that it is in his power to rear, and knows the peculiar distinguishing qualities, and the most proper method of treating each class of animals in all circumstances,—the several products that may be obtained from each, and the easiest method of encreasing or diminishing any one of these, as he may find best to suit his circumstances, he must be considered as ignorant of a very important branch of knowledge in this art. And,

Unless he knows the particular soil, and the mode of culture that is best adapted to rear each of these plants with the greatest possible perfection, he cannot practise the art of Agriculture with all the advantage that he might otherwise derive from it.

But,

language, for want of a proper one in our own. The word Agriculture, in English, is often understood to express all those circumstances that belong to the science here treated of, altho', from the obvious etymology of the word, it seems to be forced from its natural and proper signification.

But, if he knew in every case what plants his soil, in the state in which it might chance to be at any one time, could rear to the greatest perfection;—if he knew the manner of treating that soil, so as to bring it to rear other plants that it was not naturally fitted to produce;—if he were thoroughly acquainted with all the distinguishing qualities of every one of these plants, and knew, with certainty, the way in which they might be disposed of, or consumed with the greatest advantage to himself; and, if he were perfectly acquainted with the nature and peculiar qualities of every animal that he could rear, and particularly instructed in the best method of managing such animals as the plants he could raise were best adapted to nourish; so as to make every particular species of food produce the greatest possible effect, he would, on all occasions, be able to employ his time and labour to the utmost advantage for himself, and benefit to the public, and might be said to have attained the highest degree of knowledge in this art that could be desired.

Whether it is possible for human powers ever to attain to this summit of perfection, is extremely doubtful. But, it is probable, that those

those will come nearest to it, who having their eye constantly fixed upon the goal, know, with some degree of certainty, the distance they are from it, and the obstacles that must be overcome before they can reach it; and, with a well directed perseverance, steadily press forward with unremitting ardour.

To assist such ingenuous enquirers, it was proposed to enter into an accurate examination of all the particular branches that might appertain to each of the general heads above enumerated,—to endeavour to point out, under each particular head, what were the circumstances, that it would be of the greatest importance for him to know;—to enquire with accuracy what particulars relating to each had been already discovered;—to distinguish, by a careful discrimination, the facts that had been established with certainty from those that had been adopted without sufficient proofs, and to point out the most probable means of prosecuting future discoveries; that thus he might be enabled, at one view, not only to perceive all those circumstances that ought principally to lay claim to his attention, relating to any particular object, but also to know all that had been hitherto with
certainty

certainty discovered with regard to it, and the ineffectual efforts that had been made for farther improvements therein; that he might thus be taught the most likely way of availing himself of the experience of others, so as to acquire the wished for certainty with regard to doubtful facts, and thus, in the most effectual manner, promote the progress of useful knowledge.

Such was the original plan of that work which gave rise to the following disquisitions; but the undertaking was arduous, and the situation of the author by no means favourable for completing such an extensive undertaking. Upon which account, as well as the discouraging event mentioned in the introductory advertisement, the prosecution of it, upon that extensive scale, has been laid aside.

What is now offered to the public, can only be looked upon as a bare skeleton of a small part of that work; as the following sketches contain little else than a few unconnected doubts and queries, with a view to direct the attention of the farmer to some objects that do not seem as yet to have been sufficiently elucidated, without so much as an attempt to accomplish the
other

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other parts of the plan : Which may probably be at least so far useful, as it will tend to give a check to the presumptuous vanity of those, who, through ignorance of the limited state of our knowledge with regard to this art, are apt to think themselves thoroughly acquainted with every particular relating to it, when they have only got a slight smattering of the rudiments of it: For, it is imagined, that few persons who shall take the trouble to peruse these sketches will be able to avoid perceiving, that it is hardly in his power to give satisfactory answers to many doubts that are there started, or to deny that it would be of great importance to the farmer to know them.

ESSAY

other parts of the paper. It is not necessary
to at least to be able to give
a check to the proposition. It is not
who, through ignorance of the limited
our knowledge with regard to this subject,
to think the whole thing is a mystery. It is
every particular relating to it, when they have
only got a slight knowledge of the subject.
it: For it is imagined, that few persons who
shall take the trouble to read these things
will be able to avoid being misled, that it is a
ly in his power to give a false story and to
many doubts that are the result of a
that it would be of great importance to the
reader to know them.

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MISCELLANEOUS DISQUISITIONS

DOUBTS, AND QUERIES,

RELATING TO

A G R I C U L T U R E.

VOL. II.

A

*In omnibus rebus, et maxime physicis, quid non sit citius
quam quid sit dixerim.*

CICERO.



ESSAYS, &c.



MISCELLANEOUS DISQUISITIONS, DOUBTS, and QUERIES, relating to AGRICULTURE.

I.

IT can hardly be doubted, that some plants afford more nourishing food for certain domestic animals than others :---The well instructed farmer, therefore, ought to know which of all the plants that are, or may be cultivated by him, will soonest fatten any species of animals that he may have it in his power to rear ; as also, the comparative degree of nourishment afforded by each of these plants to each species of animals respectively. Wanted, on this account, an exact list of all the plants that will be eat by, and may be employed as food for cattle *, arranged in order, according to the degree of nourishment they will afford ; beginning with those that are most nutritive, and descending to such as will hardly be eat by this class of animals, or

A 2

that

* Cattle is here employed as a general term, denoting all the animals of the cow or ox (Bos) kind.

that afford them only a bare subsistence? Wanted also, a similar catalogue of plants with respect to horses,---sheep,---goats,---hogs,---rabbits,---geese, and every other species of domestic animal that could in any case become an object of the farmer's attention?



The benefits that would accrue to the farmer from the knowledge of the above mentioned particulars, are so obvious as hardly to need being pointed out; as it is evident, that he would thus be made to know exactly, not only what kind of plant would be most proper for him to endeavour to cultivate in his own particular situation, but would also know, in what manner he ought to consume any particular plant that chance or necessity might throw in his way, so as to make it turn out to his greatest profit. Yet, the experience of every reader will easily satisfy him, that so far are we from having as yet attained the accuracy of knowledge required above, with regard to *all* the domestic animals, that we hardly as yet know the exact comparative value of any two plants, with respect to any single animal; not even the favourite horse himself, who has long obtained such a particular share of attention. It is, indeed, in general, known, that certain plants may, on some occasions,

sions, be employed with profit for fattening some particular animals; but the exact proportional value of each has never, in any case that I have heard of, been ascertained by proper experiments, with that degree of precision which would be necessary in this case.

The only thing that approaches to this is, the attempt that the Swedish naturalists have made in the *Pan Suecicus* (*Amoenit. Acad.* Vol. III.) in which they have, by a numerous set of experiments, endeavoured to discover what plants are eat or rejected by the five most common and most valuable kinds of domestic animals, oxen, sheep, goats, horses and swine*. But, as it is by no means certain that animals always show a preference for those kinds of plants that afford them the most nourishing food, or the reverse†; the plan

* See the Appendix.

† Although it may be presumed that, in general, instinct points out to animals the plants that are hurtful to them, or the reverse; yet experience sufficiently shows, that this cannot be relied upon as an invariable guide—among domestic animals at least; which, by having little freedom of choice from their infancy, have their taste in all probability depraved as well as our own.—I have seen an ox that could not on any account be prevailed with to eat turnip; and there are very few put upon them, who do not eat them at first with some degree of reluctance, if they have not been sometimes accustomed to taste them before; yet, it is very well known, that few kinds of food are more nourishing or palatable to them, after they have been once accustomed to it. In the same manner, sheep that have been accustomed

to

plan that they have proceeded upon in this valuable set of experiments, does not entirely answer the purpose here required; nor affords us that degree of certainty in this respect that could be wished for. Experiments, therefore, are still here awaiting. Nor can these ever in this case be conclusive, unless they are carried on upon a large scale, and so much varied, as to guard against the particular exceptions that might be occasioned by particular idiosyncracies * or particular

to eat whins, (furze), browse upon them at all times greedily, and prefer them to almost every other kind of food; whereas, others that have not been accustomed to this plant, will never touch it till they are reduced to the greatest extremity by hunger: Although few plants, perhaps none, afford a more nourishing food for sheep than this. The same might be said of Burnet, Myrrh, and a great many other plants which are almost always refused at first by such animals as have not been accustomed to them; although they are afterwards eat with a sufficient relish.

And, if the reluctance that an animal may show to eat any plant that may be offered to it, does not always indicate that it is unwholesome, so neither does their eating it at first freely, afford a certain proof that it is innoxious. Thus, Linnaeus observes, That animals which have been accustomed to feed in the open fields are frequently hurt when carried into woodlands, by eating plants that are pernicious to them, which the cattle that had been bred in these last pastures have learned by experience to avoid. Here, then, it is *experience* and not *instinct* that guards from danger.

* *Idiosyncrasy* is a term used by physicians to denote certain peculiarities with which particular animals may be affected, that is by no means common to others of the same

cular habits of body in the animals upon which the experiments have been made.

It would be no difficult task to point out such a train of experiments, as if faithfully executed, would bring this particular to the certainty required. But, as it would require little less than princely munificence to execute that set of experiments properly, it is perhaps unnecessary here to propose them. How much is it to be regretted, that this nation, which gives the most liberal encouragement to almost every other kind of improvement, should never have thought of applying a small portion of the public money (and a very small proportion would suffice) towards the prosecuting of such national experiments in Agriculture as exceed the power of individuals to perform; and thus bringing certainty into an art the most useful, and essentially necessary to the existence and well-being of mankind! The present instance is a striking example of the real utility of such an institution.

II.

Hitherto the attention of the farmer has been too much confined to the common herbaceous plants

same class. Thus, one man may have a natural antipathy at one kind of animal, or at one kind of food, which no reason can overcome, or length of habit reconcile. This is called an idiosyncrasy.

plants that spring up in the fields, and are usually eat by our domestic animals in their native state.---Is it not probable that there may be many plants that do not seem at first sight to be reducible to this class, that might be profitably cultivated as a crop, for food to some of these domestic animals? If so---What are they?

* * *

It is not necessary here to take notice of cabbages,---colewarts,---turnips,---the coleseed plant, &c. which have been long known to be good kind of food for cattle and sheep, although they have only of late been generally cultivated as a field-crop by the British farmer.---I would wish here to turn the attention of the reader to the examination of some other plants that have not been commonly thought capable of affording good and wholesome food for domestic animals.

The Myrrh plant * (wild Cicely or Cow-weed) is often seen growing in neglected corners with great luxuriance early in the spring; and, in that state, is seldom eat by any kind of animal, unless it be sheep, which sometimes crop it.---

* *Chaerophyllum sylvestre*.

As plants have very different English names in different places, to prevent the mistakes that might arise from this cause, I shall subjoin the Botanical names of such as are not universally known.

it.—But it is not in general known that this plant affords one of the most nourishing kinds of food that can be found for cows and other sorts of cattle, at a season when few other green plants can be met with; and might undoubtedly be cultivated for that purpose with very great profit by the farmer.

The same might be said of the *Epilobium**:—A plant that grows with luxuriance upon some soils where few other sorts can be made to thrive. The young shoots of the *Epilobium*, if cut before they harden too much, afford an abundant and wholesome food for cows, at an early season—before the common kinds of grasses are fit for being cut,—as I myself have often experienced.

It has been discovered, of late, that the roots of carrots are readily eat by horses, and yield them a plentiful nourishment.—Probably many other roots, that are now neglected, might be employed as a rich food for horses, and other domestic animals.

Potatoes are well known to afford abundant nourishment to cattle—and horses; and probably they would be equally nourishing to all the other domestic animals.

It seems also probable that the roots of the Myrrh plant, if ever it should be extensively cultivated

* *Willow-herb*, or French willow.

tivated as a crop, would be of very great value in this respect;—as cattle, when they have once been made acquainted with the taste of this root, become extremely fond of it. The weight of roots of this sort upon an acre of ground, when full-grown, would be inconceivably great.

Cattle are also extremely fond of the roots, as well as the tops, of the Carraway plant *, which might on some occasions be employed for the same purposes.

Beets † were formerly more cultivated in our gardens than at present. Perhaps they ought to be chiefly valued as a food for cattle. They carry abundance of succulent leaves, which are readily eat by them;—but their roots, which used always to be thrown away, would be the principal crop as a food for cattle. They contain a larger proportion of saccharine juice than any other plant common with us. An ounce of grained sugar has been extracted from a pound of the green root; and it is well known, that nothing fattens animals in general so quickly as plants that contain sugar in large proportions.

Sheep seem to show a greater fondness for the roots than any other part of many plants, and would probably be much nourished by them, if we were at pains to select such plants for cultivating for other uses as had roots that were peculiarly

* *Carum Carvi.*

† *Beta vulgaris.*

cularly grateful to them, and the value of such crops might be greatly augmented by this circumstance.

Sheep are uncommonly fond of the leaves of the common dandelion *, and other plants of the same class;—but they will leave almost any other sort of food to search for the *roots* of the dandelion among ploughed fields where these abound. They are also exceedingly fond of the roots of all the plants of the Hawkweed tribe †.

They likewise search with avidity for the roots of the common mugwort §.

And they are also very fond of the roots of grassy leaved plantain ‡, which sometimes grow to a considerable size.

Whether they, or swine, or any other domestic animal, would eat the roots of the *Epilobium*, which are extremely tender, and very numerous, I cannot say:—But, if they did so, it might be cultivated on many occasions, by the farmer, with greater profit than almost any other crop.

I do not know if any use has hitherto been made of the roots of the Lucerne.—These, where the crop has been luxuriant, are extremely large, and afford a saccharine juice, that would probably be very nourishing to some sorts of animals. The roots are indeed tough and stringy in their natural

* *Leontodon taraxacum*.

† *Hieracium*.

§ *Artemisia vulgaris*.

‡ *Plantago minima*.

natural state ;—but, if mashed by a stone rolling about on its edge, like a tan-mill, or by any other contrivance, they would become tender enough for use.

The same might be said of *Sain foin* (*Saint foin vulgo*) roots. But, of these I speak less positively, not being so well acquainted with the nature of them.

But no plant that I am acquainted with promises to be more valuable in this way than the garden everlasting pea ; the roots of which grow in time to a very large size, and are full of a rich saccharine juice, little inferior to the garden liquorice.

How these roots could be most easily raised out of the ground, might be inquired into, after their several qualities were fully ascertained.

Many other roots might be mentioned—some of which grow to an enormous size, and are just now accounted of no value, that might possibly be of great use as food for domestic animals—All these deserve to be examined, as some of them might perhaps admit of being profitably cultivated as a crop, and others, which, although they could not be thus employed, might still be of great utility in supplying the deficiencies of a scanty crop, were they properly known.

Necessity has been, with some appearance of justice, called the mother of invention—and some persons have so strongly annexed the idea
of

of want and poverty to every œconomical experiment of this kind, that they would be ashamed to be seen making them. Those may reckon themselves happy who are under no *necessity* of exerting their genius in this manner, and ought thankfully to avail themselves of the *forced* experiments of the poor. But, it would be more for their honour, if they, with a liberal spirit of enterprize, made the discoveries for themselves.—Many trials may prove abortive;—but, if one, among a great number, succeeds, they may have the agreeable satisfaction to *feel* that they have not been entirely useless to their country, and posterity:—Nor do they spring up on the face of the earth, and decay like the weeds of the field, that only incumber the ground for a season—are trodden under foot, and soon forgot;—or are only remembered with abhorrence and disgust.

In the northern regions of Norway and Lapland, the inhabitants are obliged to try many plants, as food for themselves and cattle, which have been neglected by those whose milder climate leaves them a greater variety to chuse from. They gather the leaves and tender twigs of various sorts of trees, which they carefully preserve, instead of hay, for their bestial, and find that it affords them as abundant nourishment as any hay whatever. Ought not this to afford us a hint not to neglect our own trees or shrubs;

shrubs ; some of which might be employed with profit, even by us, were their qualities sufficiently known ?

The most valuable hay that the Romans were possessed of, consisted of the leaves and twigs of a shrubby plant,—the *Cytisus*.

And the experience of many persons in the north of Scotland, as well as of some of the discerning few in England, has sufficiently proved, that the tender twigs of the common whin *, (furze), when bruised, afford a more wholesome and nourishing winter-food for horses and cattle, than, perhaps, any other plant that has ever yet been discovered,—not excepting the Roman *Cytisus* itself: Yet few experiments have been made to discover the most proper manner of cultivating this valuable plant.

Another plant, that might possibly be of use to the farmer in this way, is the common *Laburnum*. This is nearly allied to the Roman *Cytisus* in its botanical characters. Its leaves and tender shoots are very much liked by cattle; and it grows with such a rapid luxuriance, when young, as seems to promise that a very great weight of hay might be obtained from an acre of ground under this crop.

It may, perhaps, appear a little extraordinary to some readers to hear of a proposal for making
hay

* *Ulex Europæus*.

hay from trees: Yet they have seen, that the only nation of antiquity, who made agriculture their particular study, followed this practice with success.

Nor will this appear so extraordinary when nearly examined, as it may seem at first sight. The shoots of this, as well as many other trees, are as tender, while young, and as entirely herbaceous as those of clover, or any other of the most succulent grasses; and, if these were cut while in that state, might, perhaps, afford as nourishing hay as clover, or Lucerne.

The Lucerne plant, which affords, beyond any degree of comparison, the most valuable hay that we moderns are acquainted with, if suffered to run to their full length for a whole season, are more firm and woody than the shoots of the Laburnum at the end of the season.

It is well known, that almost all sorts of deciduous trees, when cut over close by the ground, send out strong and numerous shoots, which quickly attain a much greater magnitude than if the tree had been suffered to grow in its ordinary manner. The shoots of a willow, managed in this way, will often exceed nine feet in a season, which would not have been above two or three if the stem had not been lately cut over.

I have often seen the shoots of a young *Laburnum*, in ordinary health, without amputation, exceed four feet in a season:—If a vigorous stem

stem had been cut over close by the ground, these shoots would probably have been much above that length. These young shoots are extremely herbaceous, and are covered closely over their whole length with numerous large succulent leaves, which, in figure, taste, and smell, greatly resemble those of red clover*.

If, then, a plot of ground were filled with the roots of this sort of tree, and the stems cut over close by the ground, a great number of these herbaceous shoots would spring up from every one of these stems, which might be cut

* There are two sorts of *Laburnum* common in this country, which may be distinguished by the appellation of the *broad* and *narrow* leaved *Laburnum*. It is the first sort I here allude to, in all that has been said above.

The shoots of this sort are long, irregular, and hang dangling on every side; the leaves are large, have long and weak foot-stalks, soft and pliable to the touch, and are of a light green colour, with a slight tinge of red on the young stalks. The flowers are smaller than those of the other sort, and the pods are flattened, with a soft pliable skin upon them.

The pods of the other sort are hard, round, and somewhat knotty; the leaves smaller than the other, and of a darker Saxon-green colour, with shorter and stronger foot-stalks. The branches grow more erect, and are garnished with much fewer leaves.

This sort is a more beautiful tree, but would not answer the purposes here required near so well as the other.

These trees, after they are ten or twelve years old, produce abundance of seeds, which spring up as readily as cresses, if sowed in a good soil.

cut over with a scythe at any time in summer, with as great ease as a crop of clover; and might either be made into hay, or consumed green, as should be most convenient for the farmer. These shoots spring up much earlier in the season than red clover, and might be cut once, twice, or thrice in a season, as might best suit the purposes of the owner.

The roots would continue to encrease in size, and the annual shoots in vigour, for many years, and yield successive crops without any additional trouble or expence,---if it should be found, upon trial, that the hay or grafs (if I may use that phrase) was of a valuable sort.

Nearly the same thing might be said of the common wood-bine, or honey-suckle*; some of the freest shooting, and most herbaceous sorts § of which grow to a very great length in one season; and, if managed in the same manner, would no doubt yield a prodigious weight

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of

* *Lonicera Periclymenum*.

§ There is a very great difference in this respect among the different kinds of wood-bines. The wild sort, with woolly leaves, and long thread-like stalks, would be very improper. The best sort seems to be one that has thick and strong shoots, of a greenish colour, with a tinge of red on one side, large bright-coloured, smooth, succulent leaves, and a large tuft of big-like flowers, yellow tinged with red on the outside, which begin to open about the middle of June, and continue to blow till the end of the season.

of fodder. I find, that some cattle * eat the leaves and tender shoots of this plant without reluctance. Whether it would afford them a wholesome nourishment, I have not had experience enough to say;---but there is no reason to think it would not.

Willows, and many other trees, afford long and tender shoots, which might possibly be of use in this way on some occasions, were they properly tried.

This is a walk in agriculture that may be said to be, in some measure, untrod. And, although these observations may, to some, appear whimsical, yet the subject does not, on that account, the less merit the attention of the liberal minded enquirer into the principles of rural œconomy.

III.

It is supposed, that some plants may not yield such wholesome food for animals when green, as
when

* The reader ought to be informed, that there is a very great difference among cattle in this respect. Some cows, especially those that have been bred with gardeners, refuse hardly any green thing; others can scarcely be prevailed with to eat any thing but common grass. The best way to bring a beast to eat any kind of food it has not been accustomed with, is to make it stand near one which eats the kind of food you mean to give it. In a short time most animals will be brought, in this manner, without constraint, to eat almost any sort of food that others do.

when made into hay; and that perhaps others, on the contray, afford better nourishment as a green food than as a dry.-----Wanted---An exact list of all our plants compared with one another in this respect, with regard to each of the domestic animals above named.



With regard to mankind, we know, that many plants, which, when green, are hardly fit for food, become extremely nourishing when dry; ---and that some are even poisonous in that state, which afterwards become an agreeable and wholesome food;---as the Cassava-root. And, as the *virus* * of many plants depends upon a very volatile essential oil, that may be evaporated in drying the plants, as happens with regard to the root of the horse-raddish †, it is extremely probable that the qualities of the same plant may frequently be very different in a dried or a green state. Till the farmer, therefore, is made acquainted with this particular, his knowledge is not so great as it ought to be;

B 2 and

* I have ventured to adopt this word, as I know no proper English word that is equivalent to it.---It is here employed to denote that particular power by which plants are enabled to produce any sensible effect upon the animal system; whether this be salutary or pernicious.

† *Cochlearia Armorica.*

and he must be often at a loss to know which plant he ought to cultivate for any particular purpose ;---or which way he could consume any particular plant to the greatest advantage.

IV.

It is probable that some plants which may perhaps be possessed of the same qualities when green as when in a dry state, may nevertheless be more properly and œconomically consumed by cutting them green, and employing them in that state, than by allowing them to be made into hay ; and, in some cases, perhaps the reverse of this may be the case. Wanted---A list of each of these classes of plants as above.



Great clover, and many other succulent plants, are with some difficulty made into hay ; and, in all probability, may be consumed much more profitably as a green than as a dry fodder. Because, as soon as they are cut over, the plants quickly vegetate afresh during the summer-season ; and, by being repeatedly cut over, produce a much greater weight of forage than if they had been allowed to bring their seeds to maturity. For it is observable, of almost all these succulent plants, that they push
out

out very vigorous shoots soon after they are cut over, which advance with great rapidity until the plant hath attained nearly its full stature; after which period, it advances more slowly, till it at length becomes entirely stationary, and is solely employed about the formation of its seeds. Now, if the plant be always cut when it approaches towards that stationary state, it will be always kept in the state of vigorous vegetation; and thus, it would seem, that a much greater quantity of vegetable matter would be produced, than if it were allowed to arrive at greater maturity before each cutting.

This is still more apparent with regard to Lucerne than broad clover. This plant, if allowed to come to its full size, will, in a good soil, attain the height of four feet, or a little more, in one season. But I myself have cut a plant of Lucerne six times in one season, allowing it to be about twenty inches high before each cutting; which gives upwards of ten feet for the growth of one year;—considerably more than double the height that it would have reached if it had not been cut at all. And, although it be acknowledged, that the tender and more succulent shoots, obtained in consequence of frequent cutting, would not contain such a quantity of solid matter, as an equal weight of the better matured stalks would have

have done ; yet it does not seem at all probable, that the difference, in this respect, would nearly counterbalance the other. This is an object, among many others, that cannot be determined exactly without accurate experiments.

On the other hand, it would seem probable, that some of the Culmiferous plants * or grasses, (gramina) properly so called, being less capable of recovering themselves after being cut over, when the stalks have been allowed to advance to any considerable length, as is evidently the case with regard to common rye-grass †, would afford but poor returns if cut green, although they may yield a very weighty crop of hay if suffered to attain a proper degree of maturity. But, however great the probability is, that this may be the case, still it is no more than a probability. Nor can the farmer hope to arrive at certainty in this case, till he knows, by accurate experiment, not only the exact qualities of each of these plants when green or dry, but also the quantity of each that can be produced upon the same soil with equally skilful management.

V. Some

* Culmiferous plants are such as carry an erect hollow jointed stalk, as wheat, oats, rye, &c.

† *Lolium Perenne*. Properly perennial darnel-grass, improperly called rye-grass ; as there is another plant, *secale villosum*, properly called rye-grass, and has no other English name.

V.

Some plants that may be equally nourishing to animals, and that equally require to be consumed green, may nevertheless differ in this respect, that one class may be more economicaly consumed by cutting the plants, and giving them by hand in that state to the animals that feed upon them, while another class may be more profitably consumed by being depastured by animals.-----Required---A list of each of these two classes of plants.



It will be, in general, allowed, that the two plants mentioned above, Broad-clover and Lucerne, are more advantageously consumed when cut, and given green by the hand, than when pastured upon. Probably this may likewise be, in some measure, the case with all quick-shooting strong-stemmed plants, that do not grow close enough at the root to form a firm bottom for animals to bite upon. It is likewise probable, that, in general, such close growing leafy grasses as require to be consumed green, and other weak succulent trailing plants, which run along the ground, and form a thick sward there, but do not rise quickly to a great height,
so

so as to admit of being readily cut by the scythe, would be more profitable for pasturage.---But here again we are in the region of probability; nor do we as yet know, with any degree of certainty, either the different plants reducible to each of these classes, or the several limitations that, in particular circumstances, might take place with regard to any of these.

On this subject, it may not be improper to take notice of a circumstance that ought not by any means to be overlooked by those who are obliged to supply the want of accurate experiments, by probable reasoning from detached facts that accidentally occur---it is this: By accurate observations, any one may soon be satisfied, that if the flower-stalks of the greater part of culmiferous grasses are destroyed after they are fully formed, the plants do not attempt to form other flower-stalks that season, but run afterwards chiefly to leaves, and spread by their roots. Now if, in this state, these plants are allowed to remain for any considerable length of time, without being either pastured upon or cut, the leaves gradually stop from growing,---remain after that for some time stationary, and then fade away, if they are not so luxuriant as to rot; and in this way the whole produce of a field may frequently amount to no more than a few inches in length in a season. But, if these leaves had been cut over, or a-
fresh

fresh bit down by the animals pasturing upon the field several times, the vegetation would at each time have been renewed, and it would have produced, perhaps, five or six times more, than if this repeated cropping had been omitted.

This I once had an opportunity of being satisfied of experimentally, with regard to two plants of sheeps fescue-grass *, which grew upon the same soil,---were in equal health, and in every other respect alike when the experiment was tried. The leaves of each of these two plants, before the end of May or beginning of June, had advanced to about six inches in length, and after that remained quite stationary for some weeks;---Observing which, I cut off, with a sharp knife, all the leaves of one of the plants quite close by the ground; and, in a very few days, it pushed out a set of fresh leaves with great vigour. These were cut three or four several times during the remaining part of the season, when about the height of three inches at each time; although it was not possible to remark the smallest encrease of one blade upon the other plant during all that time.

From this experiment, it would seem, that we might fairly draw the following obvious corollary, viz. That if grass, in these circumstances, is to be consumed either by pasturing or cutting,

* *Festuca ovina*.

cutting, it is the greatest want of œconomy to allow it to remain long between each of these operations; and, if we mean to reap the full profit from the field, the oftener these are repeated, after the grass is of a sufficient length for a bite to the animals which may pasture upon it, or for the scythe to strike it, so much the better.

From this experiment, we may farther infer, that it will be, in general, much more for the advantage of the farmer to consume grasses of this sort by pasturage than by cutting. For, as these grasses are always much closer at the roots than the top, when we attempt to cut them by the scythe, unless the field is as smooth as a bowling-green, a great deal of the closest of the pile will escape the edge of the scythe and be lost. And, if these cuttings are frequently repeated, the proportion that this under stubble will bear to that which is above the scythe, must be at each cutting very considerable. And as the stems, when cut over, do not, for the most part, continue to advance afterwards, but die, and are succeeded by fresh shoots that spring up from the roots, all of these stubbles are entirely lost; which, in these circumstances, might perhaps amount nearly to one half of the whole produce of the field; a great part of which might perhaps have been saved, if the field had been judiciously pastured upon.

VI. As

VI.

As the value of any plant, considered as a food for animals, varies greatly according to the season of the year when it is in perfection.---Wanted
---A list of all the plants that could be most commodiously employed for food to each different kind of animal at each particular season :
---That is to say, of plants that are in the greatest perfection in summer,---or autumn,---or winter,---or spring.



The variations that take place with regard to the growth of plants at different seasons, have been hitherto but too little attended to by the farmer; so that, were it not for the observations of the florist and botanist, we would be apt to think, that all plants were naturally disposed to vegetate chiefly in the summer-season ; advancing always with a vigour in some degree proportioned to the warmth of that season, if not deprived of a due degree of moisture.

But the curious gardener knows well, that, however necessary the summer's heat may be for bringing to perfection the greatest part of the plants that he cultivates, yet there are other plants endowed by nature with such particular
I powers

powers of vegetating, as to grow with the greatest vigour, some at one season, and that alone, and others at another. Thus the common saffron plant begins to advance towards the end of autumn,---shoots up with vigour during the winter season, and, having attained its full length in the spring, gradually declines as the summer advances; and dies away entirely in the month of June, when the greatest part of the plants we rear are in full vigour. The snow-drop,---vernal crocus,---tulip,---narcissus, and many other bulbous rooted plants, advance early in the spring, and decline before mid-summer;---as also the common chickweed,---lamb's lettuce, &c. Carnations, and many other late flowering plants, remain inactive during the beginning of summer, and only advance hastily towards perfection in autumn. The horse chestnut-tree makes its whole annual shoots in a few weeks on the first approach of summer, and has entirely stopped its progress for that season long before the ash or the oak have discovered the smallest symptom of vegetation: And this last, as well as the beech, after having made one short shoot in the beginning of summer, stops entirely for several weeks, and then, towards autumn, begins anew to vegetate with much greater vigour than before.

Now, as we have remarked these variations in the season of vigorous vegetation in these plants,

plants, Is it not probable, that something of the same kind may take place with regard to some of those plants that are, or may be cultivated by the farmer? And, it would surely be of importance for him to know all the peculiarities that take place, in this respect, with regard to the plants that it could be in his power to rear.

Some of these he is already in some measure acquainted with, and employs for his own emolument,---particularly the turnip; which only grows in a proper manner during the latter part of summer,---in autumn, and in winter.---He knows that rye-grass advances in the spring sooner than clover, or the greatest part of the other grasses that he has been accustomed to observe; with a few other particulars of that sort. But still so much remains unknown in this respect, as to be out of all proportion to what he is already acquainted with.

The plants that advance chiefly during the summer-season, and wither or die in winter, bear such a great proportion to the whole, that the farmer's chief desire should be to discover such plants as continue to vegetate late in autumn, or retain their verdure in winter, or advance very early in the spring: And, it is probable, that these may be much more numerous than is at present imagined. Although I have not had an opportunity of prosecuting
this

this subject as I could wish, the following hints may perhaps be of some use.

It would seem, in the first place, to be worthy the attention of the farmer, to examine all the evergreen perennial plants, with a view to discover if any of these could be easily cultivated, and profitably employed as food to any of our common domestic animals. Among these, it is well known that the common whin, furze, or gorse*, can be reared without any trouble, and that it furnishes an exceeding plentiful and wholesome food for sheep during the winter and spring. Nor is this plant less useful for horses or cattle when it is properly bruised; in which state, it is eat by horses in preference to the best hay or oats, and probably affords them as rich and wholesome nourishment:---And the finest winter-made butter that I ever saw, was obtained from the milk of a cow that was fed with bruised whins. Whether any other evergreen-shrubs might not, on some occasions, be profitably employed for the like purposes, deserves to be enquired into.

But shrubs and trees are not the only evergreen-plants that we are acquainted with; as pinks, and many other garden-plants, not to mention cabbages and other greens, retain their verdure during the winter. All such plants, therefore,

* *Ulex Europaeus.*

therefore, ought to be attended to with care, and accurate trials made of such of them as could be profitably cultivated by the farmer. Cabbages have been of late much praised as an inestimable winter-food for cattle; and, although it is more than probable that the encomiasts of this plant may be at present too sanguine in their expectations with regard to it, there is little room to doubt but that this, or some hardy kinds of borceole, may be found to be of real utility to the farmer, as a green, winter, or spring-food, for cattle, on many occasions.

But it does not seem, that any of our culmiferous grasses have as yet been suspected of being possessed of any quality approaching to this in any degree: For, although it is well enough known that common rye-grass, and many other sorts of grass frequently found in our fields and meadows, send out some fresh shoots during mild weather in winter, so as to assume a kind of verdure in rich grounds in a very short time after the frosts are gone; yet it is as well known, that every leaf of this plant is quickly killed by any frost, and that the verdure we at any time perceive in these grasses, during the winter-season, is always owing to a fresh vegetation from the roots. This happens to be so generally the case, that we have perhaps with too much precipitancy concluded, that it is universally so; as I have good reason to believe, that there may be
several

several species of grasses whose leaves are only in part killed by cold, and some that resist the severest winters we ever have in this climate, without being more affected by it than our common ever-green shrubs and trees.

This seems to be in a particular manner the case with regard to the otherwise valuable grass called sheeps fescue; which first caught my attention by reason of the unusual verdure of a tuft of it which chanced to spring up in the midst of a field of other grass: And having since sown the seeds of it, I find, that this was not merely accidental; but that, if it is allowed to advance before winter to a considerable length, the leaves retain their verdure during all that season, and might be employed, at any particular period during the winter or spring, as a rich pasture to any animal that could live abroad during that season.---I had a small patch of this grass in winter 1773, which, having been cut in the month of August or September preceding, was saved from that period, and had advanced before winter to the length of five or six inches; forming the closest pile that could be imagined.---And, although we had about six weeks of very intense frost with snow, and about other six weeks immediately succeeding that, of exceeding keen frost every night, with frequent thaws in the day-time, without any snow, during which time almost every green thing was destroyed;

destroyed; yet this little patch continued all along to retain as fine a verdure as any meadow in the month of May:—Hardly a point of a leaf having been withered by the uncommon severity of the weather. And, as this grass begins to vegetate very early in the spring, I leave the reader to judge what might be the value of a field of grass of this kind in these circumstances.

Purple fescue grass * likewise retained its verdure much better than the rye-grass during the winter-season; but it had more of its points killed by the weather than the former. It likewise rises in the spring at least as early as rye-grass.

Vernal grass † seems likewise to resist the winter-cold longer than many other grasses:—As does also the crested dogs-tail-grass ‡, which seems to be still more hardy than the vernal grass. But, whether either of these can be considered as altogether ever-green, I cannot pretend as yet to say; not having had an opportunity of trying them properly by themselves.

Common rye-grass, as has been already said, is altogether incapable of resisting frost; and has its leaves killed down almost as soon as any other of our common grasses. And, although it advances quickly in the spring, and furnishes a

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bundant

* *Festuca rubra.*† *Anthoxanthum odoratum.*‡ *Cynosurus cristatus.*

bundant food as a pasture at that season; yet, it has such an irresistible propensity to run to seed, that it becomes, in a short time, disliked by all animals; and is, at every other season of the year, of little value as a pasture-grass.

Soft grass *, upon damp soils, is still more early than rye-grass; and forms a much more valuable pasture-grass in every respect.

All the tribe of *Poa* grasses have their leaves entirely killed by a very slight degree of winter-cold—but they begin to vegetate pretty early in the spring.

But the earliest vegetable that I know, is the myrrh-plant †, (wild cicely or cow-weed), which rushes up in the month of March with amazing rapidity; and may be cut twice at least, if not thrice, before red-clover could be cut once. Cows, and other cattle, eat it very greedily, after they have been a little accustomed to it; although they do not always take it at first very readily.

It deserves to be remarked, however, that this plant seems to be chiefly valuable in the spring, as it seems to advance more quickly then, and during the first part of summer, than towards the end of it.—About autumn its vegetative powers seem to be much abated.

In

* *Holcus lanatus*.

† *Chaerophyllum sylvestre*.

In a few years, I shall be more able to speak with certainty of the qualities and best methods of cultivating this and some other plants; as it requires some time to bring experiments relating to them to a proper period.

And the epilobium, or common willow-herb, may be employed for the same purpose, about the same early period.

Burnet * retains its verdure pretty well during the winter-months; but affords such scanty crops, as hardly to be worth the attention of the farmer.

All these grasses spring up early, and may be employed with most advantage as winter or spring-fodder. There are, however, others that do not make their appearance till late in the season, but, on some accounts, may be deemed very valuable. Of this class is the common milk-wort †, and all the class of perennial pease and vetches; which seldom appear above ground till the month of May; but continue to yield a great burden of valuable grass during the remaining part of the season, till the winter frosts stop them. If these, therefore, were sowed along with such plants as either stand the winter, or advance early in the spring, the farmer would have it in his power to reap the benefit of his early pasture for his cattle or sheep, without da-

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maging

* *Pimpinella sylvestris*. † *Astragalus glycyphyllos*.

maging his crop for the remaining part of the season; as these would only begin to advance after the others were wholly consumed. And, as most of these plants are equally proper for being cut and made into hay, or for being pastured upon, it puts it in the farmer's power to employ them in either of these two ways that may best suit his conveniency.

I have not as yet been able to discover any plant that could be cultivated by the farmer which advances only during the winter-season. But, as we as yet know little or nothing with regard to this article, it is to be hoped that future enquirers will make many valuable discoveries relating to it.

VII.

Some plants spring up quickly, and soon arrive at perfection, while others advance more slowly, and are long of attaining maturity:—Some perish in a short time, and others, when once well established, remain almost for ever without decay. It would therefore be necessary for the farmer, who wished to improve his ground to the utmost, to be acquainted with the natural period of existence, if I may use that phrase, of every plant that it might be in his power to cultivate. Required—A list of plants considered in this point of view?

Naturalists



Naturalists have already established a few distinctions among plants in this respect;—but these are by no means so far extended as the farmer would require. For almost all that they have done, is to reduce plants to the three general classes of annuals, biennials, and perennials;—under which last head are arranged all those plants which endure more than two years. But the experienced farmer knows many plants that have but a short period of life, although they exceed this term. Broad clover usually lasts three or four years good; but seldom survives that period:—And rye-grass commonly lasts five or six years; but, for the most part, disappears soon after that time:—Sainfoin (*St foin vulgo*) lasts from twelve to twenty years;—as does also lucerne in a favourable soil; but both decline at last and die away: Whereas milk-wort, and all the classes of perennial tares and vetches, seem to be perennial in the most extensive sense of the word;—as no period can be assigned to their duration. This is probably the case with many kinds of meadow-grasses, altho' we are as yet so little acquainted with these, as not to be able to point them out with certainty.

VIII.

Some plants grow best upon ground that has been lately in tillage, and disappear after a short time, if it is not again plowed up; and others only begin to flourish after the ground has remained several years in grass. Required—A catalogue of all the plants that may be reduced to each of these classes?



Common couch-grass *,—knot-grass †, and earth-nut ‡, only appear while the ground is in culture,—or, at most, for a year or two after it is laid into grass; after which they usually disappear, and are no longer seen till the ground has been again in tillage for some time. And, it is in this way alone that the farmers, in some of the worst cultivated parts of Scotland, know how to get rid of these destructive weeds. This is likewise the case with the common small-leaved sorrell §, mugwort ||, and some other plants that are often found in fields that have been long kept under a bad kind of culture:—But these require a longer time to be fully eradicated.

* *Triticum repens.*

† *Poligonatum aviculare.*

‡ *Bunium bulbocastanum.*

§ *Acetofella.*

|| *Artemisia vulgaris.*

eradicated, than some of the former plants. On the other hand, the common milk-wort *—yarrow or milfoil †,—sheeps-fescue, and several other kinds of grass, only appear after the ground has been for some considerable length of time in grass.

IX.

It is always the case, that those plants which fatten an animal most quickly, promote likewise in the highest degree the healthiness and vigour of that animal? If they do not, Required—A catalogue of such vegetables as tend most powerfully to promote the vigour of such animals as are usually employed by man for hard labour; such as oxen, horses, &c.



Those who keep running horses and fighting cocks, seem to be fully convinced, that great muscular strength and vigour of spirit, are often promoted by certain kinds of food that do not much encrease the fat of the animal. In general, dry food seems to be less apt to produce fat than such as is more succulent; while it has a greater tendency to produce strength and vigour.

Pease,

* *Astragalus glycyphyllos*,

† *Achillaea millefolium*,

Pease, and other Leguminous* grain, have a greater tendency to increase the quantity of fat and juicy flesh than oats; although this last is, seemingly with good reason, supposed to promote muscular strength in a higher degree.—In Arabia, where the inhabitants bestow a still greater degree of attention upon their horses than with us, they are said to feed them with a paste made of dates and camels milk; which contributes to make them active and vigorous, without enclining them to grow fat.—In Portugal, it is common to feed their horses with chestnuts, as these are cheaper than barley or oats; which is found to fatten them very quickly, although it does not inspire them with so much life and vigour as those kinds of grain would have produced.—It is observed by Mr. Kalm, that, in North America, the horses are very fond of apples; but the inhabitants do not esteem them a wholesome food.—Carrots have of late been proposed as a valuable feeding for horses; but it is not as yet well known in what class they ought to be ranked with regard to the invigorating quality; although it is pretty certain that they fatten them readily.—Potatoes, likewise, have been employed, on some occasions, for the same purpose, and are still in the same state

* Leguminous grain, is such as is inclosed in a pod or capsule; as pease, beans, vetches, tares, &c.

state of uncertainty.—Turnips are eat by some horses; but how far they are either invigorating or wholesome in other respects, is not yet sufficiently ascertained.—Bruised whins seem greatly to promote the health of this animal, at the same time that it fattens and increases its strength.—But, experiments are still awanting to ascertain with precision the comparative value, in this respect, of these and many other kinds of food that may be given to this most useful animal.

X.

Do such plants as fatten an animal quickly, or tend in a high degree to excite strength and animal-vigour, always and necessarily promote its health, so as to tend to prolong the life of the animal? If they do not, Required—A catalogue of such plants as would, in the most effectual manner, tend to prolong the life of each species of domestic animals?



It would seem probable, that plants which tend too much to fatten the animal, would, in many cases, engender diseases that would shorten its natural period of life.—This seems to be pretty

pretty certainly the case with regard to sheep; as it is found that these fatten more quickly in rich vallies, which produce abundance of luxuriant succulent grass, than on higher ground, where the grass is drier and firmer; although they can be made to live to a much greater age on the latter pasture than on the former. And, as it is probable the same thing takes place with regard to other animals, it might, on many occasions, be for the benefit of the farmer to know with accuracy the distinction that takes place in this respect.

XI.

Some plants are noxious to one species of animals, which are wholesome and nourishing to others. Required—A list of plants that are poisonous to each species of domestic animals, arranged according to their degree of virulence:—Distinguishing those that are more or less so at any particular season; and comparing the effects that each may have upon other domestic animals?



Long leaved water-hemlock* is poisonous to cows; but wholesome and grateful to the goat.

* *Cicuta virosa*.

goat.—Monks-hood * is pernicious to goats ; but not at all hurtful to the horse.—Sheep, horses, and cattle, are poisoned by the broad-leaved kalmia †, which affords a grateful food to goats and deer. Parsley is deadly to small birds ; while swine eat it with safety :—And pepper is mortal to swine, and wholesome to poultry.

Other plants which are not entirely poisonous, are, nevertheless, refused by some animals, although they are readily eat by others.—Horses, cows, and hogs, refuse to eat the common ragwort ‡, which is greedily devoured by sheep, if they have access to it in the beginning of summer, before the stalks are hardened.—Cows refuse to touch the meadow-sweet §, which is highly relished by goats.—Horses eat the water-mint ||,—musk-thistle **, and many other aquatic plants, which cattle refuse to taste ;—and, on the contrary, horses refuse to eat angelica,—loose-strife ††,—geranium, &c. that are freely eat by cattle.

The roots,—the leaves,—the stalks,—the flowers, and seeds of the same plants, are very often endowed with medical qualities differing very much from one another ; so that the same
plant

* *Aconitum pyramidale.*

† *Kalmia latifolia.*

‡ *Senecio Jacobaea.*

§ *Spiraea ulmaria.*

|| *Mentha aquatica.*

** *Carduus nutans.*

†† *Lythymachia vulgaris.*

plant may be wholesome or pernicious,—agreeable or disagreeable to the same species of animals at different periods of its growth. Lettuce, while young, is a mild, agreeable, and wholesome fallad to man: But, when it arrives near maturity, its stalks contain an acrid milky juice that approaches to the nature of a poison.—Young nettles and mugwort are eat as an agreeable pot-herb by the country-people in the spring, but in a short time become rank in taste, and altogether unfit for that purpose.—Sheep greedily devour, and are nourished by the rag-weed when young, but reject it when full-grown.

Some plants, although equally noxious to animals when young, as when more advanced in growth, yet being then more tender, and less rank in taste and smell than they afterwards become, are sometimes eat at that season, and prove fatal to the cattle that graze the fields where they abound, although they are rejected with care at other seasons. Linnæus remarks, that the cattle which pastured in the meadows, near Torneo in Lapland, died in great numbers in the spring, in consequence of eating at that season the tender leaves of *the long leaved water-hemlock**, which they at other seasons carefully avoided, and that therefore they then found the pastures sound and wholesome.

The

* *Cicuta virofa*.

The Yorkshire fanicle * is usually esteemed a poison for sheep; on which account it has obtained its vulgar name *rot-grass*. But sheep never bite the leaves of this plant, as any one may remark who will carefully observe the plant at all seasons, on fields where sheep are allowed to pasture.—But I have some reason to suspect that they eat the flower and stalk—so that *if it is at all* poisonous to them, it is probably so at its flowering season.—It grows on damp grounds, which usually produce other plants that are unfriendly to sheep, which may have helped to give this its name—as its leaves are more conspicuous than those of most other plants.

Numberless other plants are more palatable and nourishing to one species of animals than another, or more or less wholesome or noxious to them at one particular period of their growth than another—But, as the farmer is not as yet in general acquainted with these, the loss that is thus daily sustained by the public is very great—so that it is of much importance to have this subject fully investigated.

XII.

Are there any plants, that tend to promote the generative faculty of animals, and render them more prolific than others? If there are,
What

* *Pinguicula vulgaris*.

What are the plants that promote this in the highest degree with regard to each particular kind of animals?



It is remarked by all travellers, that the animals in Egypt are in general more prolific than in any other part of the earth; which is by them usually ascribed to the influence of the waters of the Nile; although I would rather be disposed to believe, that some native plants of the country, joined to the mild temperature of the climate, tended to produce this effect.

XIII.

Are there any plants that have a natural tendency to excite animals to venery at any season that they may be eat? If there are,---What are the plants that produce this effect upon each particular species of animals?



Many reasons occur to make it appear probable, that there are some plants endowed with this peculiar quality: And, altho' it would be of great importance to the farmer, on many occasions,

occasions, to know these; yet, if any of them are at all known to some individuals, that knowledge is by no means so general as it ought to be.

Those farmers in England who are in the practice of rearing house-lambs, are said to have it in their power to make the ewe take the ram at any season they may incline, by making them feed upon some plants they keep for that purpose, commonly said to be thyme, or some other aromatic plants. But, as I never had an opportunity of being fully satisfied as to this fact, it is perhaps necessary to suspend our belief of it till it is duly authenticated.

I have likewise been informed that, in several parts of Scotland, the inhabitants are in the practice of pulling a certain plant that grows upon uncultivated fields, that they distinguish by the name of *bulling grass*; a handful of which they give to their cows at any time they wish them to take the bull; which, it is said, never fails to produce the desired effect. But, as I neither know if this fact can be certainly relied upon, or the name of the plant, it were to be wished that some of those who live in the place where this is practised, would take the trouble of informing or undeceiving the public with regard to this circumstance.

XIV.

The milk of domestic animals is of great importance to man; and, therefore, every particular that relates to it ought to be examined with attention. And, as it is well known that some plants make the animals that feed upon them yield a greater quantity of milk than others would have produced---Required---An exact list of such vegetables as are endowed with this quality in the highest degree, with regard to each species of domestic animals?



Chickweed * is by many thought to cause cows give an extraordinary quantity of milk. ---Spurrey, or yarr †, as it is called in some parts of Scotland, is thought by some to possess the same quality in an eminent degree; on which account, it is sometimes cultivated in Holland as an useful plant, although it is here found to be a very pernicious weed. Cattle indeed prefer it, when green, to almost any other plant; and sheep are exceedingly fond of it.

XV.

It is likewise probable that some plants may tend to make the milk thicker, and produce a greater

* *Alfina media.*

† *Spergula.*

greater proportion of cream than others do. If this is so--Required--A list of such plants as produce this effect, compared with those that promote the quantity of milk?

XVI.

Some plants communicate to the milk of the animal which feeds upon them a very disagreeable taste, while others, on the contrary, give it a more pleasant flavour.---Required---A list of such plants as produce the one or the other effect, with regard to each species of domestic animals?



It has been often remarked, that cows which fed upon certain pastures, afforded butter of a richer and more agreeable taste than could be obtained from other pastures; which would seem to be occasioned by certain plants abounding more in the one of these pastures than in the other: Yet I have heard of no accurate experiment that has hitherto been made to ascertain, with any degree of certainty, what were the particular plants that either tended to debase it in the one case, or improve it in the other.

It is indeed true, that the taste communicated to milk and butter, by some plants, is so exceedingly strong and disagreeable, that no person could avoid remarking it. Of this kind are turnips, which communicate to milk a nauseous taste, that is extremely disagreeable to most people *. Wild garlick, hemlock, and some other

* If the milk is to be used sweet, this disagreeable taste may be considerably diminished by boiling it. Other means of sweetening milk have been attempted, that are more troublesome and expensive, and not more efficacious.

It may be of consequence to remark, that, in general, that part of the milk that comes first from the cow when milked, is much more strongly impregnated with any peculiar flavour than what comes last; and as that is also the thinnest and least valuable part of the milk, it may be taken away, and applied to any other inferior domestic use, without diminishing, in any sensible degree, the products of the dairy.

By thus separating the first from the last drawn milk, the quality of the butter will be, at all times, very much improved, and the quantity hardly diminished in any sensible degree. For I have found, by experiment, that a small quantity of milk, that comes last from the cow, contains about sixteen times more cream, than an equal quantity that comes first at the same milking,—and that the cream is also of an infinitely richer quality; the colour of the one being of a very deep orange, while that of the other is as white as the paper on which I write.

Hence we may infer, by way of corollary, that no method of rearing calves can be so beneficial for a dairy, as that usually practised in the Highlands of Scotland, where it is the universal custom to allow the calf to suck its mother for some time, and then drive it away, and milk what remains

other plants, likewise affect the milk with their own disagreeable flavour.

But the most uncommon instance of this kind that has come to my knowledge, was a case that happened to a widow lady of my acquaintance, whose cows, at one particular time, yielded milk that was so strongly impregnated with a peculiar kind of bitter taste, that no person could use it in any way, which surprised her a good deal, as the cows had often been allowed to pasture on the same field, without having had their milk sensibly impregnated with that disagreeable taste. Upon examining into what might be the probable cause of that singular phenomenon, it was discovered, that, as the cows had been kept upon another field for some time before, the grass upon this field had been allowed to advance pretty far without being

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cropt.

remains in the cows udder. By this means, the expence of milking is much abridged—the calves are suckled more kindly than by the hand—and the quantity of butter not much diminished: But the greatest advantage is, that the butter is thus rendered of the finest quality that could possibly be desired. It has indeed been often remarked, that well made Highland butter is of the finest quality that can be found any where; but this circumstance, which contributes so much to its perfection, has, I believe, been overlooked.

It deserves to be noted, that there is not near such a difference between the first and last drawn milk of an old calved cow; as of one that is but lately calved.

cropt. And, as it was full of the rough-leaved dandelion *, which was then in full flower, it was imagined, the peculiar flavour of the milk was occasioned by the cows cropping these flowers in greater quantities than at any other time; which appeared the more probable, as it was observed, that this bitter taste was not perceived in the milk after the cows had remained in that field for a few days, when the flowers of this plant were almost entirely consumed.

As I have not had an opportunity of trying any experiment that could ascertain the truth of this conjecture, I would not desire that it should be relied upon as an undoubted fact; but, from the circumstances above narrated, it seems extremely probable, that the flowers and flower-stalks of some plants are sometimes endowed with qualities in this respect very different from those of the leaves; which ought to afford a lesson of cautious circumspection to the experimental farmer.

Although it is by no means certain that plants, in all cases, communicate the same flavour to milk, as that with which they affect our palate in their natural state; yet, as we know that

* *Leontodon hispidum*. This plant is sometimes called hawkweed, and ranked by botanists under the generic name of *Hieracium*.

that this sometimes happens, it may perhaps, in some cases, assist us a little in discovering such plants as may probably affect it, either with an agreeable flavour, or the reverse,--serving, at least, to point them out as proper subjects for future experiments intended to elucidate this point. With this view, having chewed, at different times, many different kinds of grasses that grow naturally in our fields and meadows, I was particularly struck with the agreeable aromatic flavour of the common vernal grass*, which seemed to approach so nearly to the rich almond-like flavour which is always observeable in the finest butter, that I resolved to gather some of the seeds, and sow them by themselves, with a view to feed a cow for some time upon this plant by itself, to discover what effect it would have upon the flavour of the milk. The seeds are saved, and are sowed; but it will necessarily be some considerable time before the result can be with certainty discovered.

XVII.

Some plants communicate to milk a rich yellow colour, and others render it pale, and almost colourless.-----Required--A list of each
of

* *Anthoxanthum odoratum*.

these classes of plants, with respect to all the different classes of domestic animals?

* * *

It is commonly imagined, that the butter which is of the deepest yellow colour, is also the richest in taste :---And although it seems probable that this may be, in general, the case, and that many of the plants that answer the one of these intentions may answer the other purpose also; yet it is by no means certain, that these are not sometimes disjoined. For I have often met with butter of a very rich flavour with little colour, and the reverse; so that it would be of consequence to the farmer to have a list of the plants possessing these two qualities separately made out.

It is a vulgar prejudice, founded upon very inaccurate observations, that plants which produce yellow flowers, in general, tinge the butter with their own colour; than which, hardly any opinion could be more absurd. Yet, upon no better foundation rests the general prejudice in favour of pastures that abound with the butter-flower*, which has evidently derived its name from that circumstance; although more accurate observations shew, that, so far is it from
being

* *Ranunculus repens*,—*bulbosus*.

being beneficial to cows, that they refuse to taste the plant, till they are reduced to the greatest distress by hunger.

XVIII.

Probably some plants encrease the richness of the milk, but do not produce a proportional quantity of cream;—some certainly make it afford cheese of a finer quality, and probably in greater quantities than others. If so—Required—A list of such plants as produce the finest cheese, as well as of those that cause milk yield the greatest quantities of it?



It has been often remarked, that if milk is of a very thick consistence, the cream is not so perfectly separated from it as if it were thinner :—That is, if water be added to it, more cream will be separated from it than if it had got no mixture. But, in that case, both the butter—cream—and whey, are poorer in quality than if it had not been mixed. And as milk naturally thin, is nearly in the same state as thick milk when mixed with water, it seems probable, that if any plant tends to render the milk thicker, it will not afford an additional quantity of cream proportioned to the richness of the

the milk *. But, if this is converted into cheese, we may expect that it would afford a greater proportion of curd, and that of a richer quality. For goats milk, which separates no cream, yields a very large proportion of curd, as well as the richest whey:—Sheeps milk, which is likewise thick, and separates little cream, comes next to it in both these qualities;—after these, in all those respects, comes cow's milk;—and, last of all, the milk of mares and asses, which are thinner, and more watery than any of the others.

It may likewise happen, that some plants which cause butter have a very disagreeable taste, may probably yield cheese of an uncommon agreeable flavour; as we require a more acrid taste in the last than the first. This ought, therefore, to be attended to.

XIX.

It is imagined, that some plants may communicate to the flesh of animals that are fed upon

* In the last note, I have taken notice of the difference between the first and last drawn milk. After the whole of the cream was separated from the last drawn, the milk that remained was thicker and richer in every respect than the cream of the first drawn. The milk of the first drawn resembled water, coloured with milk—that of the last was thick like cream—and the whey of it, when made into cheese, was richer than the milk of the other.

upon them a peculiar kind of flavour, which may be in some cases agreeable, and in others the reverse.—A list of the plants that tend to produce the one or the other of these effects, would therefore be a valuable acquisition to the farmer.



Turnips are usually thought to communicate a slight kind of nauseous taste to the beef or mutton that has been fattened by them; and mutton that has been fed upon dry hills abounding with heather *, is commonly said to have a peculiarly agreeable relish: But the flesh of sheep that have been fed upon mugwort †, is said to be of a bitter taste. The hogs that are fed upon the acorns that they gather in the woods of Germany and Poland, are reckoned to yield the finest bacon of any in Europe; and it is to this circumstance that most people ascribe the superior excellence of Westphalia hams, which have long retained their celebrity.—But the bacon of Virginia, where the hogs are fattened upon Indian corn, apples, and peaches, is by many deemed still superior to these;—and that which is fed upon grains or dairy wash is reckoned much inferior to all of them.—But as
it

* *Erica communis.*

† *Artemisia vulgaris.*

it is not altogether certain, whether the difference in the quality of the meat produced in these different places is to be entirely attributed to the flavour communicated by the food, or if it may not, in some measure, be owing to the nature of the animal itself, or to some other circumstance not usually attended to; we must here, as in other cases, wish for a course of accurate experiments.

XX.

As many unsuccessful attempts have been made to introduce plants or animals from one country into another; and, as some attempts of this sort have succeeded as well as could have been wished for, even when they were brought from very distant countries, it would be of use to the farmer, before he attempted any thing of that sort, to be made acquainted with the nature of the climate from which he intended to bring them, as well as the particular nature and œconomy of such plants or animals as he wished to encourage, that he might be able to give a probable guess before-hand, whether such attempts could be attended with success or not.



The object enquired into in this disquisition may perhaps be deemed very uninteresting to
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the farmer; and yet, upon a nearer inspection, it will probably be allowed, that, had this been duly attended to by philosophical promoters of agriculture, many improvements might have taken place in this art, with which we are as yet entirely unacquainted; and many unsuccessful attempts have been prevented that have tended to distress individuals, and, of consequence, to hurt the community. For these unsuccessful attempts naturally tend to discourage others from trying experiments of the same kind, even where there may be a much greater probability of their being attended with success. The following hints, therefore, tending in some measure to remove this difficulty, however imperfect, it is hoped, will be received with indulgence by the public.

Nature seems to have intended, that every climate should be peculiarly fitted to produce those substances that were best adapted to remove these diseases, or guard against the inconveniencies to which it was most exposed. Hence we find, that animals producing fur chiefly abound in cold regions;—the closeness and fineness of the pile of these being always in proportion to the cold of the region they inhabit, or the rigour of the season in which they are caught.—Siberia, and the northern parts of America, abound with animals that afford the finest fur, while hardly any of these are found in more southern

southern regions :—And the fur of the hare or rabbit is of much less value in the summer than winter-season, when the cold is more intense.—Hence we may in general conclude, that it is highly probable that an animal which produces a thick and deep fur, will bear to be transported from one temperate region to another that is a little colder, without suffering much injury in its person; and probably to the melioration of its fur.

But as countries that are raised to a great height above the level of the sea are extremely cold, in proportion to others that are lower, it may often happen that a particular district, even in the torrid zone, may be, in some cases, colder than one in the frigid zone.—The Andes of America, even under the line, are constantly covered with snow; whereas the heat at Torneo in Lapland is sometimes so intense, as hardly to be sufferable by man. Hence it may happen, that if a plant naturally grows, or an animal delights to feed in these elevated regions in equatorial climates, it may with good reason be supposed to be capable of being transported with safety to a much higher latitude,—unless in particular circumstances.

To give an example of the use that may be made of these observations by the farmer—Let it be remembered, that, as the wool of sheep is a particular and most valuable kind of fur, he
has

has reason to suppose, that, like other animals of the same class, the sheep is naturally fitted for cold climates; and that its wool will be meliorated by any degree of cold in which the animal can be made to live, and will be made worse if it is kept in a warmer climate.—And experience shows, that, although sheep live in the West Indies, yet, instead of wool, which they formerly carried in Europe, they there only afford a thin coat of long coarse hair, which again becomes wool after the sheep is brought back to Europe.

Again—As the fleece is coarser and thinner that grows in a warm climate, or during the season of warm weather, than where it is colder, we may expect that the finest fleeces will be produced upon such sheep as live all the year round in a cold region, where there is as little variation of climate as possible. On the Andes of America, where there is little variation of season, the wool, both of the sheep that were carried from Europe, and of their own native sheep, called Lama, and its varieties, is extremely fine.—In Persia, where they drive their sheep to the cool mountains in summer, and bring them to the vallies only during the winter, and thus keep them during the whole year round in a cool region; their wool is remarkable for its fineness, even to a proverb;—and in Thibet, a still colder country, the species of goat called
I
Touz,

Touz, yields a still finer fleece than the Persian sheep.—In Spain, where a similar practice prevails as in Persia, it is well known that they produce the finest wool in Europe. But in the northern kingdoms of Russia, Sweden, and Denmark, where the sheep are exposed to violent heats during the summer-season, they never had, nor probably ever will have, such fine wool as can be reared in the forementioned places. But, from our insular situation, which moderates alike the heat of summer and cold of winter, Great Britain and Ireland enjoy a greater equality of climate than any continental country in the same latitude can do; and are, therefore, naturally fitted to produce finer wool than any of these,—with an equal degree of skill and care in the management of this most useful animal.

From the above induction, it would likewise seem probable, that the Lama,—Guana-coe, and Paco of America, which are never found in the low and warm regions;—the sheep of Persia, which constantly seek the cold mountains;—the goat of Thibet, and other animals of that kind, might be reared with success in the climate of Great Britain;—although it is probable that they might be much hurt by the summer heats of more northern, or even continental regions.

On the other hand, these last named countries are naturally fitted to rear some products
that

that our insular situation would never permit us to cultivate with profit. Many persons who have been in Holland,---Germany, or Russia, during the winter-season, where they experience a degree of cold far greater than is ever known in any part of Great Britain, fondly imagine, from this circumstance, that every plant that can be brought to perfection in these, as they think colder countries, could be equally well reared in Britain;---never adverting that, in the same proportion as their winter colds exceed ours, their summer heats are more intense. Hence we find, that vines can be reared on the continent to great perfection, and come to maturity in latitudes more northern than ours, although the many unsuccessful attempts that have been made to cultivate that plant in this island afford the strongest presumption, that it never can be done here with profit, unless on some very peculiarly favoured spot.

The bee is an insect, the active industry of which hath long been converted by man to his own emolument,---but with different degrees of profit, according to the nature of the climate that he inhabits.—Endowed with a degree of instinct, that in some cases seems to approach towards reason, this little animal, if transported to a Tropical region, where no vicissitude of climate is ever experienced; as it can there at all times find food in abundance from the flowers
that

that constantly spring up around its habitation, is under no necessity of laying up stores for the winter; and, therefore, lives from day to day on what it collects from abroad; so as to disappoint the hopes of the possessor of the hive, if he wishes to make profit of the honey that they may have provided. But in Polar regions, where the rigour of the winter is so great as to prevent this delicate insect from getting any food at that season in the fields; with a wise forecast, it fills its hive in summer with a large store of food to supply its wants during that rigorous season;—which man greedily seizes for his own purpose. In vain, therefore, would the inhabitants of Equatorial regions hope to make profit of this surprising insect; while those in a more northern climate may have a reasonable prospect of success.

But this is not the only respect in which the climate has an effect upon this industrious and delicate creature. For, as it is benumbed by a moderate degree of cold, without being deprived of life; if the country in which it is placed does not experience a degree of cold sufficient to produce this effect, while, at the same time, it is so intense as to kill the delicate flowers upon which it might feed, the animal is necessarily alive too long; in which state it must eat: And having thus in a short time consumed all its stores, it must inevitably perish for want of food

food before the approach of summer. But, if the cold of the winter be sufficiently intense and constant, it remains during the whole of that season in a lethargic torpor; in which state it has no occasion for sustenance of any sort: So that, when it is revived by the returning heat of the spring, it finds abundance of food still remaining in the hive to keep it alive and strong till the flowers spring up, and the season becomes mild; when it begins afresh the labours of the year.

Hence it appears evident, that the climate of the continent, in which the heat of the summer and cold of the winter are alike intense and uninterrupted, is much better adapted to the rearing this useful insect than that of an island; where the heat in summer is less considerable and the season more variable; and where the cold in winter is often interrupted by sudden gleams of heat that frequently bring the bees to life long before it is safe for them to go abroad in search of food. For which reason, the inhabitants of Poland and Germany have naturally fallen into the practice of raising great quantities of honey and wax, which many in Britain have attempted with far less success.—Nor can it be expected that in our climate very great profits can be made of this insect; although it may be hoped, that, in time, the northern colonies in America will avail themselves of the advantages that their climate will afford them in

this respect, as soon as their country shall be sufficiently cleared of wood.

From not duly attending to this variation that necessarily takes place between the nature of the climate of an extensive continent and that of a small detached island, many have been disappointed in their hopes of rearing several American trees and shrubs in Britain; and have been much surpris'd to find them killed by our winter's frosts, seeing they suffer every year, in their own climate, a degree of cold much more intense than we ever experience, without sustaining any damage from it.—But, although the winter's cold be there indeed much more intense than with us, it is likewise more invariable, and the season in every respect more constant; so that there,—from the time that the vegetation is stopt in autumn, till it begins again vigorously in the spring, the sap is never once put in motion;—whereas, in Britain, the mild weather that we frequently experience in the middle of winter, very often swells the buds at that season, which gives them such a tender sensibility as makes them unable to resist the severe frosts that often follow; so that they, on this account, perish with us entirely, although they were capable of resisting a much more intense degree of cold in their own native climate.

Many likewise have been much disappointed, at finding the roots of certain garden-plants
killed

killed by the winter-frosts in Great Britain, which are seldom hurt by the much more intense cold that is experienced in Russia and many parts of Germany, from whence we have endeavoured to introduce them; by not having sufficiently adverted to the difference of the two climates:—As in these cold continental countries, the earth is constantly covered with snow, from the beginning of winter, till the genial heat in the spring melt it; by which means, they are more effectually preserved from the intense cold, than by any other covering that we could give them;—insomuch that grass advances, and flowers spring up, under its protection, so as to appear in full blossom as soon as it is dissolved.

From these observations, it appears evident that we cannot in all cases promise, that a plant will not be killed by cold in one country, although it should chance to be a native of one that is colder:—Nor can we always be certain, that a plant which comes to perfection in a temperate, or even Polar climate, will meet with warmth sufficient to ripen its seeds, even in an Equatorial region. Thus wheat,—barley,—and other kinds of grain, that rush up with rapidity, and soon attain perfection in temperate climates, can hardly at all, or with great difficulty, be brought to ripen their seeds in the Torrid zone.—For, in these last regions, although the

heat of the day is very intense, yet the length of the night that constantly succeeds it is so great, as tends much to retard the maturation of the grain,—at the same time that the copious dews that these long nights always produce in warm climates, is so greedily imbibed by the succulent leaves of these plants, as endows them with prodigious vigour to advance in length with the heat of the day ; so that the plants are urged on to grow to a prodigious magnitude. And it is so long before the ear begins to be formed, that ere ever it can be brought to maturity, the tender stem becomes unable to support the vast load that it has to carry ; and the rainy season approaches before the seeds can be ripened ;—which effectually destroys the whole plant.—But in regions that are placed nearer the pole, as the day is so much lengthened during the summer-season, the night hardly gives any check to the vegetation at that time ; and, as the dews are necessarily less abundant, the plant has not such a tendency to an over luxuriance of growth ; and the constant action of the sun soon disposes it to push out its flower-stalks, so that the seeds attain maturity with a rapidity unknown in these warmer climates.

Two countries that lie under the same parallel, and are in other respects alike, may yet differ from one another with regard to the production of certain vegetables, merely from the different

ferent form or position of these countries.—For if, from this circumstance, one of these places that may be compared together, should be more or less exposed to severe winds, from any particular point of the compass, accompanied with rains, or the reverse, at certain seasons of the year, some particular vegetables may be benefited by this peculiarity, while others may be hurt, or totally destroyed by it: Therefore some plants may be found to thrive very well in the one country, which would perish entirely, or languish in the other.

From this circumstance chiefly, it has been remarked, that the climates of China, and of North America, resemble one another very much, and that the plants which flourish in the one, prosper equally well in the other; these two countries being subjected to the same winds, at the same seasons of the year, and to rains, cold, and heat, nearly at the same periods throughout the whole year.

From this cause, likewise, it happens, that the east and west coasts of Britain are not equally fitted for rearing the same kinds of plants to perfection. For, as easterly winds prevail much during the spring months,—bringing violent rains, accompanied with sharp cold blasts, or thick muggy fogs, the vegetables that spring early are so much affected by these on the east coast, especially in the northern parts of the island,

island, as to languish, or perish entirely ;—while the same kind of plants, on the west coast, prosper abundantly.

Hence, it is found by experience, that the eastern parts of Britain, especially Scotland, are far worse calculated for producing fruit of any sort than the western parts of the island.—For, the tender blossom, in the spring, is often nipped by these cold eastern blasts, or suffocated by thick fogs, when they escape on the opposite side of the island.—For the same reason, trees of any sort, or hedges, prosper better in general near the west than the eastern shore.

On the other hand,—from the violent and almost continued rains that fall during the summer and autumn on the western coast, while that of the east enjoys a clearer sky and warmer sun, the first is much less fitted for rearing abundant crops of corn than the last.—Their harvests are later, and more precarious.—Their fruit, although more abundant, is less perfectly ripened ; and the country is better calculated, in every respect, for grass or wood, than for crops of grain.

Their winters are also less severe,—the snow lies for a shorter time,—the summers more moderate in their heat ; and the variations between the different seasons are far less perceptible, for reasons that are so obvious as need not be particularly pointed out.

By

By properly attending to these peculiarities of different climates, and to the nature and particular œconomy of the plants or animals that he wishes to rear, a man may have a tolerable guess whether or not he may hope for success in rearing plants in one country that are brought from another.—Thus, it will readily occur to any person in the least versant in this subject, that it would be in vain to expect to be able to rear any of the trees peculiar to Equatorial regions in the open air, within or near the Polar circle. Because, as there is almost no variation in the heat of different seasons in the first named regions, it is probable, that such perennial plants as are natives of it would be incapable of bearing any considerable degree of cold, which they cannot fail to meet with in the last named regions; so that there is the greatest reason to think they would all be killed at the very first approach of winter.

But there is not so much reason to despair of being able to rear to perfection, in high latitudes, some annual plants that may be natives of Equatorial countries. For, if these plants require but a short time to attain perfection in their native climate, it is not at all impossible but they may ripen in the other during the summer-season, before the cold weather of autumn approach to kill them. And, accordingly, we find that several annual flowers from these regions

gions have been introduced with success into our gardens; and probably other useful plants, if equally attended to, might have been cultivated by us with equal success.

The potatoe, which has of late been reared with such happy success in all the northern parts of Europe, sufficiently evinces the justness of this remark: For it is a native of a very warm climate, and is as impatient of cold as almost any plant we know;—yet, as the length of our summer sufficeth to bring it to perfection before the frosts approach, we are enable to cultivate it with the greatest advantage. Whether the yam, another West-Indian root, nearly approaching to the nature of the potatoe, could be reared with the same facility in Europe, seems to me a little doubtful; as it requires a longer time to arrive at perfection in the West Indies than the potatoe. But, it is probable, that many plants whose value consists in their leaves, and not a few whose roots or seeds are most esteemed, could on some occasions be introduced with success into Europe or the American continent, were the peculiarities of their growth duly pointed out, and sufficiently attended to.

But, it is not in all cases enough for the farmer to know that plants will live in the country he inhabits. Before he attempts to rear them, it is likewise necessary that he should know, if his situation is such as, with an ordinary

nary degree of care, puts it within his power to attain all those peculiarities that seem to be necessary for the well-being of that particular plant he means to cultivate. For a diversity of climate often produces a much greater variation in this respect, than most people seem to be sufficiently aware of.

Thus, in warm countries, such as Portugal, Spain, and Italy, the heat of the sun becomes so intense during the summer-months, that all the common superficial fibrous rooted grasses are totally destroyed; so that the common pasture grasses are withered, and the fields become bare and parched up at that season, unless where artificially watered; insomuch, that the inhabitants are often, from this cause, subjected to great inconveniencies for want of food to their bestial. It was therefore an object of the utmost importance to them to discover a plant, that could be made to live and thrive at that particular season, and furnish an abundant and wholesome food to their domestic animals.

Such a plant they have happily discovered in the Lucerne; which, by sending its roots to a great depth in the soil, continues to find there moisture sufficient to preserve it in a degree of vigorous vegetation when all the common grasses are totally destroyed. No wonder, therefore, that the inhabitants of these countries should consider this as one of the most valuable blessings

bleffings that heaven, in its abundant bounty, hath beftowed upon them, and never have done with its praifes.—But, in our moft temperate climate,—as we do not ftand in fuch need of a plant of this fort; fo neither do we find ourfelves in a fituation that admits of the culture of it with fo much advantage. For, here the moderate heat of our fummers, and the frequent gentle fhowers that we then have, are fo exceedingly favourable to the growth of the common fibrous rooted graffes, that every unoccupied fpot becomes quickly covered with them; and they fpring up fo clofe upon one another as to choak every other plant that is not fo hardy and luxuriant as to overtop and deftroy them.—Now, although it is found that the Lucerne plant will live and thrive extremely well in our foil and climate, if it be kept free from thefe numerous weeds; yet, it is by no means capable of deftroying, without affiftance, that immense quantity of graffy plants that constantly fpring up around it here, and ftint it in its growth, and at length totally deftroy it, unlefs we are at pains to free it from this its moft deftructive enemy; which adds very much to the trouble and expence of cultivating the plant in our climate, and prevents us from having it in our power to rear it with fuccefs in that eafy promifcuous way of fowing it, that may with fafety be practifed in thofe climates where nature

ture performs the part of the gardener, and frees it more effectually from this particular weed, than any care or trouble with us could ever effect.

XXI.

Is there any method of preparing the food of animals so as that it may be made to afford them a better or more abundant nourishment than in its native state? If there is,—What are the rules that ought to be observed in this respect, with regard to every species of aliment that may be thus improved, as applied to each species of domestic animals?



As several plants that might be employed as food for domestic animals, are of a texture too firm to admit of being easily chewed by them; whatever tends to reduce them to a finer state may probably be of use.—Thus, before furze can be properly given either to horses or cattle, it is necessary to reduce them to a sort of pulpy state, by bruising them.—Straw, on account of its toughness, is the better for being cut;—and probably it is chiefly on account of the facility with which the animal can chew it, that it affords a more abundant nourishment in this condition

dition than in its native state.—Oats are firm and smooth; and are, therefore, in danger of being swallowed whole, if given by themselves, and thus passing through the animal without benefiting it in the least; to prevent which, some mix them with chopt straw, and think they derive very great profit from this practice:—But others have of late fallen upon a much better method of effecting this purpose, by making the oats pass between two smooth rollers set close upon one another like those employed for bruising malt; which reduces them to such a state, that, with very little manducation, allows the whole of the nourishment that these can afford to be extracted in the stomach of the animal.—Slicing of turnips may likewise be of use in this respect; but mashing or bruising them, so as to reduce them to a kind of pulp, would answer this purpose much more effectually, and could be performed with much greater ease.

But, besides this mechanical sort of comminution, that may be attended with some advantages on many occasions, it is probable that many kinds of food might, by other operations be rendered more wholesome or nutritive to particular animals. The experience of man, with regard to his own food, sufficiently demonstrates, that the qualities of almost every species of vegetable aliment are considerably altered by coccion,

tion, or otherwise readying by means of fire; and, as their qualities are thus changed from what they were in their native state, it is to be supposed they might, on some occasions, be rendered more nutritive for certain animals, after having undergone some culinary process *, than in their crude state. Accordingly, we find that many farmers adopt this practice, with regard to particular substances.—Beans and pease are oftener boiled than given raw to horses;—and when cattle are fatted with this grain, they are almost always given in this state. Hay, when mashed with warm water, or slightly boiled, is reckoned much better for cows than in its dry state.—Potatoes, when given to horses, are usually boiled;—and it has been alledged of late, that hogs are fatted much more quickly, and to greater perfection, on this root, if roasted, than if it were either boiled or given in its crude state.—But, in all these cases, different persons are of different opinions;—nor do we as yet know that any *decisive* experiments have been tried, so as to ascertain, *in a satisfactory manner*, whether these practices are really beneficial to the farmer or not; or the exact degree of profit or loss that he would in any case sustain, by following the one or other of these practices.

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* Culinary process is a general term for denoting any operation performed upon aliments by the assistance of common fire.

It is likewise possible, that certain plants may, on some occasions, be meliorated by other processes. The cassava root, by being steeped in water, and afterwards hard pressed, is changed from a very poisonous substance, into a very nourishing food for man. All farinaceous * grains and roots, by malting are converted into a saccharine substance, capable of being fermented, which they were utterly unfit for before:—And, as it is well known, that nothing is so nourishing or fattening to animals in general, as saccharine juices, it is not impossible but that, by this operation, some of these might be considerably improved as a food for some of the domestic animals.—Other methods of improving vegetables in this respect, may perhaps be discovered that have not as yet been thought of.

XXII.

Is there any way of compounding different kinds of food for domestic animals, so as that their effect, when thus compounded, shall be greater than if they had been administered separately? If there is,—What are the kinds of food that may be in this manner improved, or have their virtues increased, by being given to
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* Farinacious is a general term, denoting all such vegetables as afford a mealy-like substance; as wheat, oats, barley, rye, pease, potatoes, &c.

an animal along with others?—The manner in which they ought in these cases to be administered—Whether they ought to be mixed together or given separately?—What are the most advantageous proportions of each, or in what order of succession ought they to be administered to each species of animal, so as to produce the greatest effect?—or, are there any kinds of food that, by being given to any domestic animal mixed together, or in immediate succession, tend to produce a contrary effect, by yielding to the animal, in this manner, less nourishment than if they had been given separately?—What are they?



Physicians affirm, that the effects of different kinds of medicines upon the human frame, are increased or diminished if given along with others:—Nor is it at all improbable, that this may be the case with different kinds of food upon brute animals; although our observations have not yet been sufficiently accurate with regard to them, as to have enabled us to remark, with any degree of certainty, if this really is or is not the case.—Yet, it is generally imagined, that oats given to horses along with grass, or any other green food, are less beneficial to them than

than at other seasons.—Experiments here are much wanted.

XXIII.

Are there any substances that, by being employed by way of condiment along with the food of animals, would tend to make that food produce a greater effect than if it had been given alone? If so—What are they,—and how ought they to be most efficaciously employed with regard to each species of animals?



It is pretty certain that common salt is, on many occasions, agreeable to animals in the state of nature;—nor is there much doubt but that it may be often administered to domestic animals with success; which probably acts in no other way but as an agreeable condiment, that may prepare the body to receive the full effect of the food that is given along with it,—help the digestion thereof, or make it be eat with a more agreeable relish.—In North America, there are found, in many places, strata of earth impregnated with saline matter, which the deer and other wild animals discover of themselves; to which they frequently resort to lick the saline earth

earth with their tongue. If a huntsman discovers one of these *licks*, as they are there called, he never fails to make profit of it, by concealing himself near the place, and shooting the animals that come successively to gratify their palate with this agreeable refreshment.—In Spain, and many parts of France, they give to their sheep a considerable quantity of salt, which they imagine tends both to fatten and preserve them in good health; but, it is said, they do not find it necessary where the sheep feed upon chalky or lime-stone pastures.—In England, it is well known, that animals fatten more quickly on salt marshes than any where else.—From all these circumstances, it would seem probable, that common salt is, in general, an useful condiment, and might possibly be employed on many occasions with profit in feeding domestic animals.

Other substances that promise to be equally efficacious in this respect have not as yet been attended to.—Nor have the effects of this substance been ascertained with any degree of precision.

XXIV.

Is there any method of treating animals, in general, so as to dispose their bodies to imbibe a greater degree of nourishment from the food that is given them, than they would have done

if managed in a different manner? If there is ---What is the most proper method of treating each species of domestic animals, considered in this point of view?



It is, in general, allowed, that frequent and moderate bleeding of any animal put up to feed, disposes it to fatten more quickly than it would do if that were omitted. It has been likewise often observed, that keeping cattle dry in winter, and in a moderately dark place, tended much to produce the like effect:---But it seems to be of still greater consequence to keep them in an equal temperate warmth, which, on many occasions, will operate as much as a considerable quantity of food would do without it.---But what is the most proper degree of heat for each species of animals, has not as yet been attempted to be ascertained.---Currying or combing some animals likewise tends greatly to promote their health, and bring them forward in feeding; particularly the horse But, how far it might be beneficial to others, hath not yet been enquired into ---Castration of males tends to meliorate their flesh, and to make them fatten more quickly: And it is, in general, observed, that females, when with young, fatten more quickly than at any other time. But, how far they may be allowed to advance in their

their pregnancy before it becomes detrimental, requires as yet to be enquired into.

XXV.

Does that mode of treating any animal that tends to make it fatten quickly, at the same time tend to encrease the quantity of milk? If there is any difference in this respect--Wherein does it consist, as applied principally to cows, and other domestic animals that are chiefly of use to us on account of their milk?



It would seem probable, that the same mode of treatment would often answer both of these purposes,--although there is some reason to think, they may not, in all cases, coincide.---Warmth in winter causes cows give more milk, as well as fatten more quickly, than they would do if deprived of it.---The same may be said of proper dryness, cleaning, &c. But it is universally allowed, that bleeding a milch-cow tends to diminish the quantity of milk;---and it also gradually decreases in quantity as their pregnancy advances, till they are very near the calving.

Whether salt promotes the quantity of milk in the same proportion that it tends to fatten,

will probably be known by those who have had the experience of salt-marshes.

XXVI.

Does a difference in the nature of the pasture or food of the animal produce any change upon the *quality* of the wool of sheep, or the hair of other animals, independent of other circumstances? If it does---What are the changes produced by this means?



It is, in general, believed, that particular pastures are peculiarly favourable for producing fine wool; and that improvements, by clover and other artificial grasses, tend to improve the quality of this valuable commodity;---although it seems to me, by no means certain that this fact is so well established by experience, as to deserve to be implicitly relied on.---The countries that produce the finest wool do not always afford the richest pastures.---Neither the mountains of Persia, nor those of Spain, produce grass nearly so rich as many parts of Europe that afford wool of a much inferior quality.---In England, the pastures of Cotswold and Leominster, have nothing peculiar to themselves that may not be met with in many other parts of this island;

island; so that we may justly doubt if it is owing to this circumstance that the wool of these places has been so long distinguished for its superior quality above that of other parts of the country.—It is not more than a hundred years since it became common to cultivate clover and other artificial grasses in Britain; and we have no reason to think, that the quality of our wool has improved since that time, but rather the reverse.

Neither does it seem at all probable, that richness of pasture tends to debase the quality of the wool,—seeing the sheep of Lincolnshire, of the Isle of Wight, and of Romney-marsh, which feed upon rich deep grass, yield fleeces of an exceeding fine quality; although the fine sheep of Buckinghamshire, that feed upon equally rich pastures, and become as fat as any of these, always afford wool of a much coarser quality.—But, whatever effect the nature of the pasture may have in altering the fineness of the pile of the wool, there seems to be little doubt but that abundance of food is necessary to give it its full strength and firmness; as it seems to be universally allowed, that a very lean sheep never yielded a fleece of wool of the very best quality, with respect to strength and softness, whatever may be the case with regard to fineness of the staple. This subject is of much importance, and deserves to be fully investigated.

XXVII.

Does the nature of the climate alter the quality of the wool of sheep? If it does—What are the changes produced by this means?



It is a prevailing opinion with many, that fine wool can only be produced in mild climates, rather approaching to warmth than the opposite extreme; which has, in like manner, in all probability been adopted precipitately, before the subject was duly investigated.---Reason would make us rather expect that the contrary would be the case; and experience seems to confirm it, as appears N° XX. p. 58, to which I refer the reader. The subject is of great importance, and, therefore, ought to be discussed with all the coolness and circumspection imaginable.

XXVIII.

Does the fineness, or any other quality of the wool, vary with the age of the sheep;---or is the weight of the fleece encreased or diminished by a difference in this respect?

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The price of wool is so low in Britain, and the value of the fleece here bears such a small proportion to that of the carcase, that less attention has been bestowed to the circumstances that may vary it, than the importance of it to the country in general would seem to deserve; we have, therefore, so few opportunities of seeing old sheep, that our experience can only furnish grounds for slight conjectures on this head. ---Probably more satisfaction could be obtained from Spain than any other country at present, with regard to this and the other disquisitions relating to wool, as it has been long a staple commodity with them, and almost the only vendible produce of their flocks; so that it must necessarily have claimed a great share of their attention. ---It seems, however, to be in general allowed, that the weight of the fleece diminishes with the age of the sheep, after a certain period.

XXIX.

Is there any mode of management that would tend to make a greater *quantity* of wool be produced upon the body of the same sheep, than there would have been if it had been
treated

treated in another manner? If there is—What is it?

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The French have of late bestowed a very particular degree of attention upon their woollen manufactures, and have spared no pains to meliorate their wool and improve their breed of sheep. By an experiment, conducted under the direction of the Intendant of Normandy with this view, it appears, that sheep which are kept all the year in the open air, yield fleeces about one fourth part more weighty than the same kind of sheep that were kept at night, and in bad weather, under a covered fold; and the wool of the first was likewise of a much better quality in every respect.—Whether any other mode of treatment tends to produce a similar effect deserves to be enquired into.

XXX.

Can the quantity or *quality* of the wool be improved or debased by any particular mode of managing the sheep, or by applying any particular substances to the skin of the animal while the wool is growing? If it can—What are the circumstances, or the substances that produce this effect?



In every sheep-country there are many *nostrums* and particular recipies handed about, or generally adopted, which are believed to contribute to the improvement of the wool in some of the ways above mentioned. But these are, in many cases, so evidently useless, and seem, in general, to have been adopted with so little reason, that an enumeration of such of them as may have come to my knowledge would be only tiresome to the reader; for which reason they are here omitted.—A judicious experimental philosopher, however, who would investigate this matter in a proper manner, and elucidate the subject by decisive experiments, would do an essential favour to his country;—as, in all probability, our future success in the woollen manufacture will depend upon our attending more particularly to the article of wool than we have done for more than a hundred years past; during which period there is very great reason to suspect, that the quality of the wool in England, instead of growing better, has become sensibly worse; while that of our neighbours on the continent has been greatly improved.

At what age can animals of each particular class be fattened with the greatest facility ; and at what period of life is the meat of each kind in the highest perfection, supposing it to be equally fattened,

While animals are young and growing vigorously, as a great proportion of the food they eat goes towards encreasing the size of the body, it is natural to expect that these will be with more difficulty brought into full fatness, than those which have previously attained their full stature ; but, if the flesh of these young animals is much esteemed, it may often happen, that the owner of these may have more profit by feeding them, even under this disadvantage, than by keeping them till they attain their full maturity. It, therefore, becomes a question in rural œconomics, in what cases the one or the other of these modes of feeding ought to be adopted ; which could be the easier solved, did we know exactly what was the proportional difference of the expence of feeding different classes of animals in each of these cases.

With regard to the last part of the query—It is sufficiently well known, that young mutton

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is never so agreeable to the palate as such as hath attained to full maturity ;—but how long it continues to improve, does not seem as yet to have been so fully ascertained as it ought to be.—There does not seem to be near such a difference between young and old beef or pork ; and, therefore, the farmer is, or ought to be, under less restraint with regard to these.

XXXII.

Do different classes of animals require an equal quantity of food in proportion to their size ? If there is any difference in this respect—What is the exact amount thereof with respect to each particular species of domestic animals when compared with others ?



It is certain, that if we compare very different orders of animals with one another, we will discover a prodigious difference in this respect.—A caterpillar will consume in a day more than double its own weight of food, while the chameleon would be sustained for months upon a like proportion of food ;—the camel is likewise believed to require a much smaller quantity of food in proportion to its size than almost any other quadruped.

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But, to come to those in which we are more nearly interested—It is universally believed, that an horse requires a greater quantity of food to sustain it than an ox of the same weight: But I have never yet heard of any experiment that has accurately determined what is the exact proportion in this respect.—Common opinion seems to place it at different proportions; some-time rating the horse at double the ox, and sometimes at only one third more. For, in many parts of the country, the price of the summer food of an ox is precisely one half of that of the horse; but, in other places, the difference is only as four to six.—Whether either of these is exact, or which of them is nearest the truth, deserves to be ascertained with precision. But, as the opinion is so universally prevalent, that the horse requires a greater quantity of food in proportion to his size than the ox, the probability is, that he really does so.

As the other kinds of domestic animals differ more in size from one another than these do, it is not so easy to make a comparison between them;—but, as it is possible they may vary considerably from one another in this respect, the farmer must remain very much in the dark with regard to a very essential branch of his business, till this be determined with precision.

XXXIII.

We observe, that there are a great many varieties of each particular species of animals, that are distinguished from others of the same species by certain peculiarities that are on many occasions easily perceptible. These varieties among the brute animals have been usually distinguished among farmers by the appellation of different *breeds*; as they have supposed that their distinguishable qualities are, at least, in a certain degree, transmissible to their descendants; although naturalists, overlooking these distinctions, consider each of these as only an accidental variety of the individual, which hath little or no influence upon their progeny. Query, therefore,—Whether these different *breeds*, as they are called, of any one class of domestic animals, is really a distinct tribe, endowed with the power of transmitting to its posterity all its distinguishing properties, so long as it is prevented from intermixing, by copulation, with other breeds; or are the varieties that we perceive, in this respect, to be attributed to accidental causes alone, and not immediately depending upon the nature of the parent animal?

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We would imagine, that, in a case of so much importance as this we now treat of, with regard to which mankind have had so many opportunities of trying experiments, and making particular observations, there could have remained no room to doubt long before this time. But, although science, in general, tends to improve knowledge, on some occasions, it rather confounds and perplexes the understanding. For, when we find that the systems we have invented are incapable of explaining all the phænomena that occur, we are but too ready to despise, with a fastidious pride of mind, those phænomena that would perplex our system, and hastily to say, they owe their existence to inaccurate observations alone.

This seems, in a particular manner, to have been the case in the present instance. And, although it is impossible for any reasoning to get the better of daily experience, so far as to make a man believe directly the reverse of what he sees with his own eyes; so as that nothing can convince the farmer that the nature of the animal from which he breeds will not have some influence upon its progeny;---yet it has so far prevailed, as to induce almost every farmer to believe, that, unless in the particular cases that have

have occurred to himself, all the other varieties observable in the breeds of animals, are either entirely occasioned, or much influenced by peculiarities of soil, food, or climate. So that in no instance do we meet with such an unaccountable discordance, between general opinion and particular practice, as in this very case.

That all the qualities which serve to distinguish particular breeds of animals from one another can, in some cases, be transmitted without alteration to their posterity for ever, if they are always kept from copulating with other breeds of the same kind, seems to be fully demonstrated by what we observe with regard to dogs; the different varieties of which are endowed with such remarkable peculiarities, as serve to point out the particular breed with so much certainty and facility, as makes it impossible for any one not to perceive at once if the breed has been debased: And our experience with regard to them is so universal, as to leave no room for the most ignorant to doubt, that all the varieties of these that we meet with, inherit, from their parents, the peculiar distinguishing natural talents that they possess; and that these are in no case to be attributed to any diversity of food, or any other circumstance whatever.

The same thing is also, in a great measure, remarked with regard to the horse;---although the different varieties of this animal are not so distinctly

distinctly marked as those of the dog-tribe; and, therefore, the proofs of the fact in dispute are not so palpably evident as in the other case. Yet we would surely laugh at the absurdity of that man, who should hope to rear a large-boned weighty dray-horse by breeding from a fine Arabian mare and stallion; or who would expect to have a light-running horse from a father and mother of the dray-breed; let him feed them in whatever manner he may incline. And, although the different breeds of horses are almost infinite, and few of them so much different from each other as in the above example, yet it is observable, that the prevailing breed in any one district always continues of the same kind, so long as the inhabitants of that district continue to breed from them, whatever alterations they may make in the general culture of the country, and nature of the pastures. Nor do these horses ever alter their qualities, if they are carried to another district, where another breed of very opposite qualities, in general prevails; but each retains its distinguishing qualities to the last, although they should continue to eat the same food, and be treated in every respect alike to the latest hour of their lives.

Nor is the case in the least different with regard to cattle, sheep, and hogs,—and perhaps all other animals. For, let a hundred different
breeds

breeds of either of these kinds of animals be brought from as many different places, and fed upon one common pasture as long as you incline, each of these will continue to preserve every mark of distinction from all the others so long as it lives.—But, if these are allowed to breed promiscuously, the progeny would necessarily be a mongrel breed, participating of the nature of each of the parents who should have contributed to produce them.

Many other arguments might be adduced to show, that we have the greatest reason to believe, that each particular breed of other animals propagates its own kind with as little variation as is acknowledged to be the case with dogs, so long as they remain unmixed with others. But these, to avoid prolixity, I omit.—I could not, however, avoid throwing out these observations on a subject of so much importance; as the erroneous opinions that have so long prevailed with regard to it have been, in some cases, attended with consequences highly detrimental to the community.—If these hints shall induce others to examine the subject with attention, I shall be perfectly satisfied.

XXXIV.

If different *breeds* of domestic animals do, on many occasions, possess particular qualities, that differ very essentially from those possessed by

other breeds of the same class of animals; and if these qualities are transmissible to their posterity without alteration, so long as the breed remains unadulterated by an admixture with others, it will be a matter of the utmost consequence to the farmer, to be well acquainted with the nature and distinguishing qualities of every particular breed of all those animals that he may have it in his power to rear; that he may thus be enabled to choose only that particular breed which possesses, in the highest degree, those qualities of which he means chiefly to avail himself.—Wanted, therefore, An exact list of all the various breeds of domestic animals, with a particular specification of all those qualities for which each breed is peculiarly remarkable?



There seems to be great reason to believe, that the several breeds of domestic animals differ more from one another with respect to some of those qualities that may make them more or less valuable to the farmer than is in general apprehended at present. The gentlemen of the *turf* and *menage* talk with the utmost confidence of different degrees of vigour, persevering strength, hardiness, and even mental qualifications, if I may use that expression, of the different

ent breeds of horses. Those of Spain are much praised, as well for their external beauty as for their judgment and memory. The Barbe is deemed naturally more indolent; although he is capable of as high exertions either of body or mind, when obliged to it, as almost any other: Being in an especial manner, capable of continuing in any violent exertion much longer than most other horses; although the Arabian courser is by some thought to possess these same qualities in a still higher degree.—All of these require to be nourished with care, and treated with the utmost circumspection. On the contrary, the horses of Denmark and Friesland are said to be stronger and more hardy,—live upon any fare, and are hurt by no sort of bad treatment.—The Neapolitan horses are large and showy; but are incapable of any violent exertion, and are soon exhausted, if they are much put to it.—The same qualities are remarked in many of the large-boned showy horses in England; on which account, those only are by the connoisseurs deemed capable of undergoing the violent fatigue of hunting, racing, &c. which have, in the jocky-style, at least *some blood* in their veins. By which is understood, that they are descended, either by the father or mother, from an Arabian, Persian, Turkish, Spanish, or Barbary horse or mare: All of which are supposed,

posed, in an eminent degree, to possess great muscular strength and length of wind.

But, besides these more remarkable distinctions, there are many other varieties of this useful animal reared in different parts of this island, and only employed for draught and other useful services, that are well known to differ from one another as much in their degree of hardiness or *mettle*, as it is sometimes called, as in their external form and appearance.—Some of these are of such enormous bulk and strength, as to drag slowly after them the load of an elephant, but are utterly incapable of any violent quickness of motion.—Others are naturally endowed with greater agility and less bodily strength as to carrying burdens; but are possessed of great hardiness, so as to be capable of enduring fatigue for a long time, without being hurt by it.—Some attain their full degree of strength and bodily vigour at a very early period of life; while others continue long extremely weak, and incapable of great exertions; but, after they arrive at six or eight years of age, become hardy and capable of exerting their strength for a very long time without being hurt. Some are naturally cool and persevering, while others are more fiery and fretful, and can never be brought to yield that steady exertion of strength that the others naturally do.—In short, the varieties in this respect are so many and great, that
it

it would require a very extensive experience to be able to point them out with any degree of precision.—But, were it once done, it would be of the utmost utility to the farmer; as he would then know exactly what breed would best answer the particular purpose that he on any occasion might wish to accomplish.

It would perhaps be of still greater utility to the farmer to have all the peculiar and distinguishing qualities of each of the different breeds of cattle pointed out with precision; which probably do not differ less from one another than horses do.

Many attempts have of late been made by improving farmers in different parts of Britain to better the breed of their cattle. But, as the particular breeds of cattle that have on these occasions been transported from one part of the country to another, have been usually selected on account of qualities that they were only *supposed* to possess, rather than in consequence of any full investigation of the subject by which their real good or bad qualities have been pointed out with accuracy; it may be much doubted, if these attempts have been in many cases attended with any beneficial consequences at all. For, so long as we are guided in this case by any other rule than that certainty that results from accurate experiments, it may be naturally supposed, that the mind of the sanguine improver

prover will be apt to magnify every excellent quality that he may think he perceives in his favourite breed; while it as naturally diminishes the good qualities of such as may be out of favour at the time.

Thus, at one time, the large Dutch breed of cows were much in vogue, and were much more valued than any other kind.—But, in a few years, it was discovered, that they did not possess all the qualities for which they were at first cried up; and they gradually fell into disesteem.—These were succeeded by the Yorkshire,—which in their turn were succeeded by the Lancashire breed; which is at present more esteemed than any other sort, and will probably continue to be so for a few years; when they in their turn will be neglected, and give place to some other favourite breed which accident may recommend to public favour.

In this manner it may be expected that things will go on, till mankind shall become so sober-minded, as to be firmly persuaded that perhaps no one breed of cattle is possessed of all the different qualities that could be desired on different occasions; and, therefore, set themselves seriously to distinguish from one another the different qualities that may render this animal, on any particular occasion, more or less valuable, and then endeavour to discover which particular breed possesses that one quality in the highest

highest degree.—Thus, one man perhaps requires above all other qualities, that his cattle be possessed of great bodily strength, and a power of exerting the nerves and muscles for a great length of time without being fatigued.—Another perhaps disregards this quality, and only wishes for an ox that will admit of being fattened quickly, and carry a great weight of beef.—A third, perhaps, requires that that weight should be chiefly in some particular part of the body.—A fourth values only the quantity of the milk.—A fifth is chiefly anxious about its quality;—while a sixth is, perhaps, more anxious to obtain the beef of a peculiarly fine quality than any of these;—or values his cattle for some other quality, different from any of these above enumerated.

But, were we to know with certainty which particular breed possessed, in the highest degree, that peculiar quality that we most wished for, and the other peculiarities that it possessed along with this, we would be enabled to pick out with precision that particular breed that best suited our particular purpose, or the circumstances that we were in at the time; leaving others to make choice of some other breed that might be still more profitable to them.

Hitherto we have been so little accustomed to consider this subject in this point of view, that it would be in vain to look for facts that
could

could be relied upon with regard to it, from the writings or conversation of such improvers as have endeavoured to introduce any particular breed into any district. For these kinds of cattle are so much praised for every excellence when they are in vogue, and so indiscriminately decried after that period, that it is next to impossible to distinguish the qualities for which they are truly estimable from those for which they are by no means remarkable.—It seems, however, to be pretty certain, that the large Dutch breed of cows do usually yield a very large quantity of milk, although it is but of an inferior quality; while, on the contrary, the small delicate Alderny breed of cows are as remarkable for the richness of the milk, and the delicacy of the butter that it affords.—And, although the Lancashire breed is just now in favour, and thought, in general, to possess almost every quality in the highest degree, yet the ingenious Mr. Young has ventured to assert, that cows of this breed do not yield near so much milk in proportion to their size as the Suffolk cows.

As to other qualities, there is so much room for the imagination to magnify or diminish them as prejudice may suggest, that we can hope for nothing decisive with regard to them without fair and accurate comparative trials, made under the direction of some man of probity and discretion.

But,

But, if it would be of some use to the farmer to know with accuracy the distinguishing characteristics of each particular breed of cattle, it would be of still greater consequence for him to know with certainty all the varieties that take place with regard to sheep; which, perhaps, admit of a much greater diversity; and, on account of the value of the fleece, it is probable, that it would be of much greater national consequence to have these accurately pointed out.—As no attempt hath as yet been made to ascertain, with any degree of precision, the distinguishing qualities of each of the different varieties of this species of animals, it is in vain to hope for any thing like certainty on this head for some time to come.—The following hints, however, intended to serve as a slight beginning for such an investigation, it is hoped, will be received with indulgence by the public, on account of the great importance of the subject.

Many of the peculiarities by which different breeds of sheep are distinguished from one another are obvious to the senses; and, therefore, afford an easy criterion for distinguishing them from one another: Although it is also probable, that they may, on some occasions, differ from one another in less obvious, although not less essential respects.—The following are a few of the most remarkable peculiarities, in respect of which

which different breeds of sheep vary from one another.

1st, A very great variation is perceptible in different breeds of sheep with regard to *shape*.--The Dorsetshire sheep are tall and light of body, much resembling the camel in shape and proportions;--and the breed that is most esteemed and recommended by Mr. Bakewell of Leicestershire are large bodied and short-legged, more resembling the figure of the beaver.---The other varieties of shape and proportions are almost infinite. And the same may be said of all the peculiarities under mentioned.

2^{dly}, Some breeds of sheep have horns, and others have none at all.--In Lincolnshire a horned sheep is a rarity;--and, on the contrary, in Dorsetshire, and some parts of Wales, a smooth-headed sheep would be looked upon as a sort of wonder.--In some other places, four, six, or even eight horns, are not uncommon.--The horns of sheep are usually twisted;--but some breeds have long horns, bending a little backward, but not twisted, like those of the goat.

3^{dly}, Different breeds may be sometimes distinguished from one another by the colour of their faces.--In Lincolnshire all the sheep have white faces; and in Norfolk they are as universally black.

4th, Different breeds vary from one another in respect of the length or shortness of the wool.

—The fine combing wool of Lincolnshire, Romney-marsh, &c. sometimes measures half a yard in length;—the wool of Spain exceeds not two inches; and that of Dorsetshire, Cotswold, and Leominster, is little longer.

5th, They likewise vary from one another with regard to the manner in which the wool grows upon the sheep.—Sometimes the whole body is uniformly covered with a coat of wool, the hairs of which are slightly interwoven with one another, as if they had been frizled by art;—as in the Dorsetshire, and, in some measure, the Lincolnshire sheep.—Sometimes it divides into separate locks, which, on some occasions, hang down long and lank, in some measure like combed hair;—as is the case with a breed of sheep common in the south of Scotland. And sometimes these meshes are done up into separate small close curls, like a wig of baken hair;—as is peculiarly remarkable in a breed of sheep in Sologne, (a district in France), insomuch that it has there become a common proverb, that the wool of Sologne has been curled by the bill of the larks*, the meshes are so small, and the curls so exceedingly close.

6th, They also differ from one another in respect of the fineness of the pile of the wool.—

The

* *La vraie laine de Sologne est celle qu'a été frisée par les alouettes.*

The wool of Persia, Segovia, Leominster, and several other parts of Britain, are well known to be as remarkable for their uncommon degree of fineness, as that of Cornwall—and of Norway, is for the exceeding coarseness thereof; these being said to approach nearer to the nature of hair than wool†.

7th,

† It has been already remarked, that the climate has some effect upon the quality of the wool of sheep, the finest wool being most naturally produced in the coldest regions; from whence some may be disposed too hastily to conclude, that the several variations we meet with in this respect, ought to be attributed to that cause alone. But that distinct breeds of sheep differ very much from one another in this respect, independent of the influence of climate, is sufficiently obvious from this circumstance, that we find in different districts of the same country, which enjoy an equal temperature of climate, wool of very unequal degrees of fineness; and frequently we meet with sheep, in cold countries, that carry wool of a much coarser quality than what is found in regions considerably warmer than they are. Hence, therefore, we ought to conclude, that although warmth of climate invariably tends to make the wool that grows upon any sheep coarser than it would have been upon the same sheep, if it had been in a colder climate yet that this has no influence on altering the nature of its progeny, nor even of producing any change upon the animal itself, longer than it is immediately under the influence of that heat. A sheep that has been carried to the West Indies, and there lost its wool, when it returns to Europe again, affords a fleece of as fine wool as before it went out to that warm region: And, in temperate

7th, They likewise differ from one another in colour.--In Europe, white sheep are most common;

perate climates, the points of the wool, that is to say, that part of the fleece that springs out from the sheep's body during the warm weather in summer, is always much coarser than that part which grows during the cold weather in winter; the difference between the top or bottom of the fleece being always in proportion to the difference between the heat and cold that the sheep has experienced at these different seasons, and consequently is smaller where sheep perambulate, as in Persia and Spain, than in countries where they never change place at all: And, in this last case, it is always greater in northern continental countries than in islands, as has been already remarked. A variation with regard to the climate, therefore, produces only a temporary change upon the fineness of the wool of that individual sheep that is immediately exposed to its influence; but the difference in this respect that arises from a variation of the breed of sheep, is of a more permanent and invariable nature; as any two sheep, originally of different breeds, not only retain the same difference between one another, if they are, at the same time, carried through any diversity of climates, but their descendants also retain, at all times, if in equal circumstances, the same difference that was observed to take place at first. Hence, therefore, it may happen, that a particular breed of sheep may carry, at all times, coarser wool in a cold climate than another breed that always lives in a warmer region; the influence of the climate not being so great as to counter-act the superior influence that is derived from the parent stock.

It is of much consequence that the reader should accurately distinguish between these two different circumstances that influence the quality of the wool of sheep; because,

common; and next to these black are most frequently seen.---In Persia, they have wool
of

cause, if this is not done, he will be embarrassed and perplexed by seeming contradictions, that it will be impossible for him to explain; so that he will be apt to remain irresolute and undetermined in his conduct. For if, without this knowledge, he should have attempted to improve his wool by bringing some fine sheep from a colder region to his own, and should afterwards find, that, instead of very fine wool, that they yielded in their native country, they produced to him no finer wool than his own sheep formerly afforded him, he would be apt to imagine that the nature of his climate over-ruled every other circumstance, so much as to bring the fleece of every different kind of sheep into one quality, which he would look upon as the standard of his climate or situation; and, therefore, might think, that it would be in vain for him to attempt improving it.—And if, at the same time, he should have chanced to bring, from a warmer climate, another breed, that in their native country yielded wool of a coarser quality than his own, and should afterwards find, that the wool produced from these sheep was of the same fineness with that of his own sheep, he would be still farther confirmed in his opinion of the over-ruling influence of his climate, and rest satisfied, that, as he could not hope to improve the quality of his wool, so he need not fear that it could ever be debased; and that, of course, he needs give himself no sort of trouble upon that head.

But if the foregoing case were just reversed:—Had the farmer first chanced to take a fancy for some fine woolled sheep that were natives of a warmer region, and transported some of them to his own country, where he found the wool become much finer than it formerly was: And should he afterwards, in his travels, meet with another breed in a colder country that produced still finer wool than the other
afforded,

of three colours; white, reddish, and silver-grey.—In the province of Andalusia in Spain, there is a race of sheep that are brindled, and spotted black and white;—and, in the Isle of Man, there is said to be another breed that carries wool of a light buff-colour.

8th, They likewise differ from one another with respect to the purity of their wool.—Some breeds have their fleece perfectly free of any mixture whatever, while others have a greater or smaller proportion of a particular kind

afforded, and, hoping that a similar change would result from a change of place in this case as in the former, should get some of these also transported to his own country,—How great would his amazement be when he afterwards found that these sheep, instead of being improved by that change as formerly, had degenerated so far as to produce wool of a coarser quality than either of the former! Without having known or attended to the foregoing distinction, this phænomenon would have appeared inexplicable. But it would not have been attended with such fatal consequences as the listless indolence occasioned by the seemingly natural conclusion that was drawn from the former experiment.

Before I conclude this note, it may be proper to remark, that, although the change produced upon the quality of the wool by a *great* variation of climate is very considerable, yet a *small* variation in that respect produces no sensible change; so that the farmer may, in general, disregard this circumstance in the changes, that he may think it proper to make by transporting the sheep of one district of the same country into another district.—The variation of the breed in this case being almost the only circumstance worth attending to.

kind of hair intermixed therewith, that is known in some parts of England by the name of *Stichel* hair; and in the northern counties by that of *Kemps*; and in France by the appellation of *Jarre*.---This is a kind of short opaque white-like hair, that grows up among the fleeces of some kinds of sheep, that may be easily distinguished from wool by its dead-like colour, and by being always thicker at the roots than towards the points, (which is the reverse with wool) and by having no degree of elasticity.---As no wool that has any mixture of this can be properly dyed, or wrought into any valuable manufacture, it ought to be guarded against with the most scrupulous attention.

9th, Different races of sheep likewise vary very much from one another in respect of size.---In Shetland there is a breed of sheep so small, that, when full grown and fat, will not weigh above three or four pounds per quarter;---and another nearly as small as this is kept as a curiosity in some parts of Normandy in France. Whereas in Flanders, and some parts of England, it is not uncommon for a quarter of mutton to weigh forty or fifty pounds*.

10th,

* We have seen, that, although different breeds of sheep vary from one another very much with regard to the fineness

10th, They also differ from one another by the length of their tails.—In Scotland, the tail of
 VOL. II. H the

ness of their wool, and that this difference between them, so long as they remain in equal circumstances, is permanent and invariable, yet that a variation of the heat of the climate does produce a sensible effect upon the quality of the wool of every kind of sheep; and, in like manner, although there can be no doubt but that there are different breeds of sheep and other animals differing essentially from one another with regard to size, yet it is equally certain, that some variation may be produced in this respect by the nature—abundance, or deficiency of their food. Thus, supposing that all the different breeds of sheep were fed upon pasture where they had at all times as much good food as they were able to destroy, and were treated properly in other respects, there seems to be little doubt but that some of these would be of a much larger size than others; whose descendants, in these circumstances, would continue to retain the same difference for ever, if they were never suffered to copulate with one another: Yet, if any of these are carried to another place, where they find a more scanty subsistence, their progeny will gradually diminish in size, so as never to reach the stature of their original progenitors so long as they remain in that half-starved condition. But if, at some distant period, some individuals of this unnaturally small breed of animals should chance to be carried to another district, where they should have more abundant food and warmth when young, their progeny would gradually out-grow their parents, till at length they should attain the full size of the original parents of their race; after which they would remain stationary so long as they would enjoy this abundance of food and other requisites. It is from this cause that animals in Alpine countries, in which their young are usually stunted in their growth for want of abundant nourishment and genial warmth,

the common breed of sheep does not reach lower than the knees; the tails of English sheep usually reach the heels in their natural state.—I take no notice here of the broad-tailed African sheep, as it is not a native of this part of the world.

The variations that take place with regard to the above mentioned particulars are so easily distinguishable, that the most inattentive observer cannot fail to have remarked them on many occasions. These that follow are not perhaps less certain and permanent, although they do not so sensibly attract the attention.

11th, Certain parts of the fleece of every sheep are finer than other parts of the same fleece; but the difference in this respect in different

warmth, are almost always smaller than in low and fertile countries, where they more usually attain their natural size. Those, therefore, who alledge that it is in vain to hope to alter the size of the animals bred in any country, because the pastures, &c. in each place will either raise or diminish these till the animals attain the size that it is naturally fitted to produce, have some reason for what they alledge, although it is not strictly true. Want of abundant food, or an unnatural degree of cold, will always retard the growth of a young animal, and make it stop before it hath attained its natural size; so that a large breed may thus become, in certain circumstances, no bigger than one that was naturally of a much smaller size. But no treatment could ever bring a breed naturally small to equal the size of one that was originally large, if it is reared where it can have food and warmth in abundance.

ferent races of sheep is very great.—Sometimes the wool about the neck and shoulders will be remarkably fine and filky, and that on the buttocks of the same sheep be exceeding hard and coarse; and, on the other hand, some kinds of sheep afford a fleece in which the difference in this respect is far less considerable.

12th, In the same manner, as we observe that some individuals of the human species have the hair of their heads much thicker and closer than others, so it may be observed with regard to different breeds of sheep, that some of them yield a much thicker and more weighty fleece in proportion to the bulk of the animal than others do. It would, therefore, be of great use to the farmer to be able to know with accuracy the exact difference in this respect between any two varieties of this species of animal that he might have it in his power to rear.

13th, Some kinds of sheep give a much greater quantity of milk in proportion to their size than others do; and, therefore, make much better and fatter lambs than these, upon pastures equally good.—This is a distinction seldom attended to, although it might be on many occasions of the utmost consequence to the farmer.

14th, It is well known that certain breeds of sheep are more disposed to produce twins than others.—There is in Holland a large breed of sheep that seldom have less than two, often

three, and sometimes four lambs at a time—In Lincolnshire, and some other parts of England, the ewes almost universally produce two lambs; and in other parts, where the sheep are equally well fed, this is a sort of rarity.

15th, It is likewise in general believed, that some particular kinds of sheep are more easily disposed to carry lambs twice a-year, or bring them at different times of the year, than others are.—The Dorsetshire sheep have been said to possess that quality in a peculiar degree;—and, although this could seldom be of much utility, yet, as it might, on some occasions, be of use, it would be an advantage to the farmer to know all these*.

16th, It

* It is commonly said that, in Egypt, sheep year twice a year. Possibly, in that warm climate, this may not be such an exaggeration as the same hyperbolical expression is, when applied to more northern climates; although some modern travellers have denied that this is the case, even in Egypt. An ewe goes with lamb five months; so that, supposing she either did not suckle her lamb, or that she again took the ram while giving suck, within one month after yearning, (which is a thing that I believe rarely, if ever happens, with regard to this species of animals,) it would be barely possible that they should regularly produce lambs twice a-year. But, as this is a thing that cannot be expected to turn out to any valuable account, in a climate like that of Britain, we may look upon it rather as a matter of curiosity than otherwise. As to their bringing a lamb, perhaps very early in one season, and another so late, as that both are brought forth within the course of
one

16th, It is also in general believed, and probably with good reason, that some particular breeds of sheep are naturally more hardy, and less subject to diseases or accidents of any sort, than others; although the farmer has not yet the satisfaction of knowing experimentally if this be really the case or not.—Or, if it is,—What are the particular breeds that are eminently distinguishable for this valuable property?

17th, It does not seem in the least contrary to reason to believe, that there may be some particular breeds of sheep and other domestic animals, that may perhaps by nature require less food to sustain them, than others of their own species of an equal size with themselves may require. Yet I know of no experiment that has been made with a view to determine this important question, from which we could draw any useful conclusion.—But, as it is of much importance to have this fact ascertained with precision, it surely merits the special attention of those who may have it in their power to prosecute experiments of this sort.—The reasons that induce me to think that this might probably be the case, are as follow.

We have already seen, p. 91. that some animals of one genus require a greater quantity of food

one year, I consider it as an abuse of language to call that having lambs twice a year; and, therefore, as deserving no farther notice.

food than those of another genus, although of an equal size: From which we may be led at least to enquire, if this may not on some occasions happen to be the case with regard to different varieties of the same species.---Some horses will thrive upon harder fare than others; and some kinds of cows are more easily kept up in winter than others; which would seem in some measure to corroborate this conjecture.

And, that something of this kind does actually take place with regard to the different varieties of dogs, seems to be in general allowed;---as I never heard it disputed by those who had attended to this circumstance, as to this class of animals, that that particular breed of dogs called pointers, require a much larger proportion of food to keep them properly than grey-hounds do; and that mastiffs take still less food, in proportion to their size, than grey-hounds*.---I would be far, however, from asserting these as undoubted facts;---but popular opinions have for the most part some foundation in truth; and, therefore, deserve to be confuted by experience, or indisputable arguments, before they are fairly rejected.

If

* This observation seems to be confirmed by the experiments of Mr. Arthur Young, who finds that some kinds of cattle require one third of their weight per day to feed them, and others only one fifth. Exp. Agr. Vol. II. article cattle.

If this difficulty were solved, it would enable us to devise proper experiments for determining another that has been often proposed and debated with much warmth, altho' it can admit of no final solution till this previous doubt be discussed, viz. Whether it is most profitable for the farmer to rear animals of a large breed, or such as are smaller: That is to say, Whether a large breed of sheep or cattle require food of a better quality, or in greater quantity, in proportion to their size, than such as are smaller: Or, in other words, whether the same field of grass would rear a greater weight of beef or mutton, if it were depastured with a breed of large, or another of small cattle or sheep.

A large animal is so beautiful to look at, and conveys such an idea of plenty and luxuriance to the imagination, as is apt to catch the fancy, and impose upon the judgment so much, as not to allow us to attend to all the circumstances that might produce some effect, with that cautious circumspection that is necessary in œconomical disquisitions of this sort. Hence, it has usually happened, that those improving farmers who have endeavoured to better the breed of these two useful kinds of animals in any one district, have attempted to do it, by introducing a larger instead of a smaller kind: Which circumstance alone they have always considered as a capital improvement.---But, it has as generally hap-

happened, that the bulk of the inhabitants in every country, imagining that large animals of any sort require a greater quantity of food, in proportion to their bulk, than smaller ones, as well as a more careful management, have always looked upon these attempts to introduce a larger breed among them, rather as hurtful than beneficial; and have, therefore, opposed such innovations with all their might.---Now, if it should be found, upon a proper examination, that some varieties, either of the ox or sheep, require a greater or smaller proportion of food than some other varieties of these do; it would be possible that each of these two opposite opinions might, in different circumstances, be just. For, it might so happen that, of two varieties that should be compared with one another in one corner, the smallest might be the most hardy breed, and that which required least food in proportion to its size,---while, in another district, where the same experiment should chance to be tried, the largest of the two might possess these valuable qualities in a more eminent degree. So that, till the first difficulty is finally determined, we can draw no general conclusion from any particular experiments that might be made with a view to elucidate the second.

The above catalogue comprehends almost all the particulars that occur to me as contributing to occasion any variation between the different
races

races or breeds of sheep.—And, if it be considered that not only each of the opposite qualities above enumerated, may be possessed by different breeds in all the intermediate stages between the one extreme and the other ; but also, that any one or more of the other peculiarities may be blended with these in all possible proportions, we will easily perceive that the varieties produced by this means may be almost infinite ; —so that it is perhaps impossible to form any adequate idea of the improvements that might be made in this particular branch of rural oeconomics, should the general attention be properly directed towards it, and the judicious efforts of individuals be long enough continued.—But, as many opinions prevail on this subject that seem to have been derived from the limited observations of private individuals, who have not had an opportunity of being better informed, that very much tend to discourage the attempts that might be made towards improvement in this respect ; it may not perhaps be improper, before we leave this head, to examine, with some degree of attention, a few of these opinions that may first occur.

It seems to be an opinion rather too universally prevalent, that that breed of animals which is found in any one district, is more peculiarly adapted to the nature of the climate and other circumstances relating thereto, than any other that
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could be introduced into it; and that, of consequence, any attempts that may be made towards any improvement in this respect, will not be attended with the expected success.—But, although it should be allowed, that the beneficent Creator of this universe, hath in general provided every country with these productions, whether of the animal or vegetable kingdom, that are most essentially necessary to the existence of the inhabitants thereof; yet, as daily experience proves, beyond a possibility of doubt, that peculiar animals, as well as vegetables, are sometimes found in one country, and not in another, which is exactly similar to it in every respect, in which these animals or vegetables do thrive when transplanted to it, as well as in their native country; it would seem that this partial deficiency had been wisely so ordained to serve as a spur to human ingenuity and industry,—as a most powerful mean of promoting that social intercourse between different nations, which hath such a direct tendency to correct local prejudices, and humanize the soul, rather than to repress those vigorous exertions of the mental powers in which the principal happiness of man so evidently consists.—And the success that has attended many attempts of this kind, and the benefits that result from thence to society in general, sufficiently confirm the observation.—The silk-worm was long confined to a particular

lar district of Asia alone, although it has been reared for hundreds of years past to as great perfection in many parts of Europe, as in its original native country.—Pears, cherries, peaches, apricots, and all the other fine fruits of our gardens, are natives of other distant countries, and were utterly unknown, not only to our ancestors in Britain, but to all European nations:—Even cabbages, coleworts, and colliflowers, with almost all the numerous train of garden-roots and pot-herbs, were only of late introduced into Britain; where they are now reared in greater perfection than on any other part of the globe.—Horses, cows, and sheep, were not known in America before the Europeans settled there;—and peaches, which now grow wild in every corner, and flourish with a luxuriance unknown in every other country, were only introduced into these regions by the first settlers from hence:—And it is but of yesterday that the first handful of rice was accidentally brought into Carolina; where it has since prospered so exceedingly, as to enable the inhabitants of that country to supply almost all the markets of Europe and the West Indies with that useful grain.—In short, the benefits that society hath reaped from judiciously transporting the animals or vegetables of one country into another that might stand in need of them, are so many and great, as might fill whole volumes

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barely

barely to enumerate; and ought to serve as a strong incitement to us to attempt such farther improvements in this respect, as well informed reason may point out as useful.

It likewise happens to be too universally believed, that the peculiar qualities of any breed of any domestic animals that may have continued long in any one district, are chiefly to be attributed to the nature of the pasture, or some other peculiarities of the soil or climate of that district, and not to any difference in the primitive qualities of the original breed of animals.— Thus, an inhabitant of Lincolnshire fondly imagines, that the fineness of the wool that his sheep produces, is owing to the peculiar temperature of the air which that county enjoys, or the nature of the pasture that there abounds.— A native of Cornwall as sincerely believes that the very coarse fleeces that his flocks afford, are to be attributed to similar causes: In which opinion, each of them is strongly confirmed by observing, that, if any sheep are introduced into either of these counties from any other district, that carry wool of a different quality from that of their own, their progeny, in a short time, lose all those original marks of distinction, and can no longer be perceived to differ in any respect from their own original breed. From which they, with seeming good reason, naturally conclude, that it is in vain for them, in the one case, to
hope

hope to improve the breed of the country; and that it is equally foolish, in the other case, to give themselves any uneasiness lest theirs should degenerate; seeing the pastures or climate of each county will quickly bring any strange breed of sheep to a perfect equality with their own. And thus each party sits down contented with his own flock, thinking that it is out of his power to make it better or worse than it happens to be at the beginning.

I do not, however, know a more fallacious experiment than this, nor one that is attended with more pernicious consequences to the public; and, therefore, it deserves to be examined with the most scrupulous attention.

The fact is undoubtedly true; but the inference that has been drawn from it is probably extremely erroneous. As there seems to be the strongest reason to believe, that the change produced upon the progeny of these strange sheep, is to be entirely attributed to the mixture of the blood of these with the native sheep of the country, and perhaps not at all to the influence either of the soil or climate.—For, as it is next to impossible to keep a few sheep distinct by themselves in any country during the rutting-season, it is not to be doubted, but that the lambs produced by this promiscuous copulation will participate of the nature, both of the father and mother. And, as this mongrel breed likewise inter-copulate in their turn with the native sheep of
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the country around them, their descendants more nearly approximate to the nature of these; and the progeny of these coming still nearer and more near to the native sheep of the country in a geometrical progression, it must necessarily happen, that, in a short time, the qualities that distinguished these strange sheep at first, being so much divided among their descendants, become altogether imperceptible to the senses.—In the same manner, a drop of milk, mixed with an equal portion of water, becomes sensibly diluted; and, if that compound is mixed with a larger quantity of water, it becomes still more and more colourless; and, if the same operation be repeated several times, the single drop of milk dispersed through a whole bucket of water, seems to be totally annihilated, and does not sensibly diminish the transparency of that limpid fluid: Although there is no doubt but that the milk is still there present, and is no farther altered than by being divided into such minute parts as to elude our senses.

That the change produced upon the descendants of these strange sheep is to be attributed to the cause above mentioned, and not to the influence of the pasture or climate, seems highly probable from this circumstance, that we frequently meet with distinct breeds of sheep in two neighbouring districts, that vary very little from one another, either with respect to climate or pastures; as is the case with the neighbouring

bouring counties of Lincoln and Norfolk;—each of which hath possessed, for hundreds of years past, their own particular breed of sheep, that are very easily distinguishable from one another; these being more effectually kept from intermingling with one another than can usually happen in two neighbouring counties, by the fens and the wash that separate them.

But what proves beyond a possibility of doubt, that these changes are not to be attributed either to the soil or climate, but merely to the intermixture of blood, is, that the original sheep that come from one district into another, may remain there as long as you incline, without undergoing any change;—the alteration being only observed to take place with regard to their descendants.

It is probable that any one of the distinguishing properties above enumerated, may be united with any other of these in the same animal in any proportion. Nor does it appear that we are as yet possessed of any facts that should induce us to believe that any two of these qualities are more usually connected with one another than any other two or more of them; although popular prejudice has, on some occasions, supposed that some of these are more naturally connected with one another than they are with some of the other qualities.—Thus, many are disposed to connect, in their own minds, the

the idea of fineness of quality of the wool, with smallness of size in the animal; although it does not appear that we are possessed of facts sufficient to confirm their conjecture.—The sheep of Lincolnshire and Romney-marsh are among the largest in England; and carry much finer wool than those of Derbyshire and Northumberland, which are of a much smaller size.—Neither are we to conclude, that largeness of size necessarily produces fine wool. For the Tees-water sheep are as large as any of these, and afford a wool of a very coarse quality.

Others are disposed to imagine, that the length of the wool is, in some measure, connected with the size of the sheep; thinking that small sheep have always shorter wool than those that are larger.—But, neither is this confirmed by experience.—The Dorsetshire sheep, which yield short carding wool, have a much larger body than a small breed of black-faced sheep in the south of Scotland, that carry wool almost as long as any in England;—and the sheep that produce the finest short Segovian wool in Spain, I am assured, from good authority, are nearly of as large a size as the best breed of sheep in Lincolnshire.—The last named sheep afford a proof that the largeness of size does not obstruct the length of the wool; although the Tees-water sheep, which are much larger, do not produce wool of near such length of staple as these do.

Others

Others again are more disposed to think, that fineness of staple is in a great measure connected with the shortness thereof.—But neither do we here meet with the facts necessary to confirm their hypothesis.—Lincolnshire wool is much longer than that of Durham, Derbyshire, or Cornwall, and is at the same time of a much finer staple.—The longest wool upon the same fleece is indeed usually the coarsest part of it, from whence, in all probability, this opinion has been derived.

Others think, that fineness of wool is connected with delicacy of constitution in the animal:—But this we have no reason to imagine from experience. For we do not find that the fine wooled sheep of Shropshire, Somerset, Hampshire, Kent, Lincoln, or Surrey, are more tenderly treated, or subject to more accidents, than the other coarser wooled sheep in the kingdom. And, if I might venture to speak from my own private experience, I could safely affirm, that, after having kept in the same flock for some years, several distinct breeds of sheep, some of which yielded much coarser wool than others, it has so happened, that the finest wooled sheep have been at all seasons in the best order.—From which, however, I would by no means infer, that this is always the case. As I make no doubt but that these two qualities, fineness of wool, and delicacy of constitution, may be

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sometimes

sometimes united in the same breed, as well as any other two qualities.

Others think, that those sheep that carry fine wool have necessarily a thinner fleece, and consequently less wool in proportion to their size, than such as yield coarser wool.—But neither have I met with any facts that would induce me to believe that this is always the case.—The sheep in my own flock, which have the finest wool, yield likewise the most weighty fleeces in proportion to their size, in the *ratio* at least of three to two.

I might go on and enumerate several other qualities that have, with as little reason as the above, been supposed to be necessarily connected with one another; but, to avoid prolixity, I decline going any farther in this investigation at present; hoping I shall not be accused of precipitancy, if, from the above examples, I should infer,—that we have much reason to think that sometimes one or more of these distinguishing qualities may be found united with some other of these in one particular breed of sheep; while these same qualities may be united with some other distinguishing peculiarities in some other breed. And, as this may be varied almost to infinity, it ought to put us much upon our guard against drawing general conclusions from any particular experiments.

It would seem likewise that we might naturally infer from the above induction,—That, seeing there may be such an infinite diversity in this respect, no one needs ever to despair of being able to improve his own particular breed, so long as it is not possessed of all the valuable qualities that he would wish for. As it is possible that he may meet with another breed that possesses these qualities he wants, or may get them communicated to his own, by properly crossing them with others: And that, therefore, instead of sitting down in listless indolence, trusting entirely to providence for the meliorating his flock, he may have his eyes always open to mark every advantage that fortune may throw in his way, and his reasoning faculty alive and active, so as to distinguish with accuracy how far any proposed alteration may be intended with any essential improvement, or the reverse.—If the Cornish farmer, and others who like himself are possessed of a breed of sheep yielding very coarse wool, or such as is mixed with *stitchel hair*, (kemps), instead of sitting down contented with these as the best that his situation would admit of, had, with a discerning attention, studied to better his breed, he might have reaped from thence, long ere now, some very essential benefits *.

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But,

* I have been informed, and have good reason to believe, that the Cornish hair, as it has been usually called, has

But if, from the above induction, we have room to hope for high degrees of improvement, we likewise from thence see great reason to induce us to proceed in our attempts of this sort with the most cautious circumspection. Because, if we do not attend to all the collateral qualities, if I may so express myself, that any particular breed of sheep may possess, united with that particular one we wish to obtain, it may so happen that, for the sake of that one estimable quality, we may sacrifice several others of much greater value *.—But, if we have all these important objects in view, and bestow upon each its proper degree of attention, it is impossible but our attempts must be attended with success †.

And,

has been somewhat improved of late, by an attention to improve their breed of sheep.

* Those spirited farmers who wish to improve the quality of their wool, by introducing fine sheep from other countries, ought to be on their guard, lest they thus introduce diseases into their flocks that are not easily eradicated.—Of late, an alarming disease has made its appearance among the sheep in Lincolnshire,—improperly called the *rickets*.—It is not infectious by contact—but runs in the blood, and seems to be always hereditary.—It never fails to be fatal to all the sheep that are affected by it, as no sort of cure has yet been discovered for it.

† The very great improvements that have been made upon the breed of horses in Britain, ought to encourage us to hope that, with an equal degree of attention, we might
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And, as nothing could so much tend to facilitate any attempt for an improvement of this sort, as an exact enumeration of all the particular breeds of sheep that can be found in this or any other country, with a special description of all the distinguishing peculiarities of each, it is very much to be wished that such a thing could be accomplished.

Goats are in general much less esteemed than sheep. Yet, as these may be properly kept in some situations where no other animal could live so well, it might be also of use to have a special enumeration of the various breeds of this species of animals, with a particular enumeration of the peculiar qualities of each.—On the mountain called *Sierra de Strella*, near Almeida, in the province of Beira in Portugal, I have been assured, that there is a breed of large fine goats, remarkable for yielding a very great quantity of milk;—a gallon, or a gallon and a half English, (two or three pints Scots,) per day.—These would probably be of great use for being taken into ships for long voyages, were they introduced into Britain.

Whether the goat of Angora that affords the fine silky hair called Mo-hair, be only a variety of the common goat, as Dr. Hafslequist imagines,

be able to make a still higher improvement on the nature of our sheep; as the climate is more favourable to this animal than the horse.

gines, or a distinct species by itself, seems not as yet to have been ascertained with certainty.—But of this, and some others of the same class of animals, I shall have occasion to speak hereafter.

The peculiar properties of the different breeds of Hogs are as little known as of the other domestic animals; and, therefore, deserve to be enquired into.—The small Chinese hog is vastly different from the large English breed in size and appearance.—But we have as yet no accurate experiments on which we can with certainty rely for ascertaining the peculiar qualities either of these or of the different breeds known in Europe.

XXXV.

It is in general believed, that old pastures are much more valuable than new.—Is this really the case;—If it is,—To what causes ought this to be ascribed?—or, Are there any means of obviating this inconvenience?—What are they?



That some old pastures may be found which afford a greater abundance of excellent food for quadrupeds than any that are new, is a fact so universally acknowledged, as hardly to admit

admit of a dispute;—but there is as little room to doubt that the opinion which in many places so much prevails, that every pasture field that is old, is necessarily better and more profitable to the community than if it were ploughed up and again judiciously laid down to grass, with the system of farming that has been engrafted upon it, of absolutely restricting the possessors of such fields in any case from ploughing them up, has been attended with very pernicious consequences. It is, therefore, of much importance that the false principles upon which this opinion is founded should be exposed, and the erroneous tenets that have been adopted in consequence thereof be exploded.

It is but about a hundred years since the practice of sowing any kind of grass-seeds was first introduced into Britain. And as, before that period, every field, when allowed to remain unploughed, became in time covered with such grasses as chanced to have their seeds or roots in the field, without any effort of the farmer; these were called natural grasses, in opposition to those that have been since that time propagated by sowing; which have been called artificial grasses.—And, although these last are in many cases indigenous plants, and as much natives of the soil as any others; yet this inaccurate distinction still prevails, and along with it an opinion, that, as those plants that are found to
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spring up spontaneously in the soil are evidently better adapted to it than those that are thus, as they imagine, contrary to the intention of nature, forced upon it; so, of consequence, it is better to allow these quietly to establish themselves, than to force them to give way to strangers.

This mode of reasoning has probably induced many to imagine, that every attempt to improve our pastures, by sowing what they call artificial grass-seeds, will be without success:—In which opinion they are farther confirmed by remarking, that those fields that have been attempted to be laid out for pasture, and have been sowed with the seeds of these artificial grasses, have hardly in any case produced a pile so close or fine as what is frequently remarked in those old pastures which bountiful nature hath clothed with her most valuable robe.

It will not, however, be alledged, that our fields, if left to themselves, will furnish such abundant crops of cutting grass or valuable hay, as may with certainty be obtained from them by cultivating some of these artificial grasses; so that we have the fullest proof that nature may in this case be improved upon. And, although it is certain that none of the grasses that have been hitherto cultivated by the farmer, are of the most proper kind for pasturage; yet there is little reason to doubt, but that many of the most valuable
kinds

kinds for this purpose would admit of being cultivated with the same ease as some of those are with which we are well acquainted, if they were properly separated from others, and cultivated with equal care.

But, so long as we shall remain ignorant of the peculiar qualities of each kind of grass, so as not to be able to distinguish the good from the bad, it is not surprising, that we should remain firmly persuaded that nature alone can provide valuable pastures, and that age is so essentially necessary for bringing them to their ultimate perfection.—For, if we allow our fields to remain uncultivated, without having sowed them with any kind of grass-seeds, it must ever happen, that the seeds of such grasses as are brought by the wind or otherwise from the neighbouring fields, will there take root, and in time establish themselves.—And, as it may sometimes happen, that some of the most valuable pasture grasses may there abound, the field, in these cases, will become filled with their seeds, and in due time may afford the most valuable pasture. But, if bad kinds of grasses should abound in the neighbourhood more than the good, the field will as naturally become filled with the seeds of these useless plants.—And, as a number of these are hardy and abiding plants, if the field is once filled with them, the pasture will be of consequence always of little value, if it should

should be allowed to remain undisturbed for any length of time.

Thus we see that the only difference between natural and artificial grasses is, that, in the last case, the seeds are sown in such quantities by the husbandman, and so properly disposed for vegetating, that they come up at once in such abundance, as to fill the whole field entirely, without allowing room for other grasses to spring up in any considerable proportion among them;—whereas, in the first, the seeds are only slowly and scantily brought by the winds, and exposed unprotected to all the vicissitudes of weather; so that it is long before the field becomes fully stocked with them, and must at last be filled with such sorts as may be the most hardy that chance to be in the neighbourhood, whether they be good or bad.

And as in these circumstances the roots of short-lived grass, such as couch-grass,—knot-grass,—narrow-leaved sorrel,—wild-mint,—and others of that sort, that are usually found in loose cultivated ground, being allowed to spread without interruption; and as they have, in this case, no other plants to contend with, they advance for a year or two after the field is laid in to grass with the greatest luxuriance; so that the first two or three crops of grass on such fields consist almost entirely of these, together with such annual weeds as spring up in such uncul-

uncultivated fields. And it is only after these plants gradually die away that the weaker and more valuable perennial grasses begin to establish themselves, and the pasture becomes gradually better, if circumstances should have concurred to establish the seeds of these valuable grasses in that field.

Thus we discover the reason why natural pastures never can be so good when they are new as they may become afterwards.—Whether the same objections lie against artificial pastures is not so certain.

The above will be acknowledged to be a fair and genuine account of the establishment and progress of a field of natural grass; and well demands the serious attention of the reader.—Consider, I beseech ye, what are the numerous circumstances that must accidentally concur together before it is possible to expect a very fine field of pasture-grass, if left to nature, and then tell me, what is the chance that any one has to expect that all these should concur to produce their full effect in any one field whatever.—There must be no roots of bad grasses, nor seeds of robust annuals in the soil when it is left out from tillage.—The seeds of the most valuable kinds of grasses must be in the neighbourhood in such abundance as to fill the whole field sufficiently at once. Nor is this all.—For as there are no doubt a considerable variety of valuable
kinds

kinds of grass, some of which are naturally fitted to grow to perfection on one kind of soil, or upon that soil when in certain circumstances, while others would thrive best upon another soil, or upon that soil only in certain peculiar circumstances; it must so happen, that these very plants that are best adapted to the soil in the state that it may be in at the time, should be found in abundance in the neighbourhood of the field.—Neither must there be found near that any sort of robust quick-growing plant, the seeds of which, by being blown upon that field, might suddenly rush up and suffocate, in their infancy, these tender and valuable plants.—Nor must there be there found any bad kinds of grass, that, by being established along with the good in any proportion, might tend to diminish the value of the pasture.—Now, let any one reflect on the infinite diversity these few particulars may admit of, and how utterly impossible it is that all the favourable circumstances, without any of those that are unfavourable, should concur in any one case, and he will acknowledge, that those who found their hope of obtaining the most valuable pastures only upon the fortuitous concurrence of all these circumstances, or who imagine that every pasture that is old must, on that account, of necessity be good, act in direct contradiction to the plainest dictates of reason and common sense.—For, although it
should

should be allowed, that the grasses hitherto cultivated are not of the most proper sort for forming good pastures, and that, therefore, on some occasions much better natural pastures may be met with than could be formed by means of any of these, yet it by no means follows from thence, that, if the farmer were perfectly acquainted with the value and distinguishing qualities of each kind of natural grass, and knew the soil and culture that best agreed with it,---the most proper manner of rearing it, and every other particular relating to the œconomy thereof, he might not perhaps have it in his power to form artificial pastures as much exceeding the natural as these last at present usually exceed the former.---Because, were he endowed with the knowledge above supposed, he could at once fill his soil with the seeds of those valuable grasses that he knew were best adapted to it, and thus effectually exclude the admission of every useless plant or pernicious kind of grass that might be brought from the neighbouring fields by the wind, or other accidental causes*.

Thus

* I cannot, on this occasion, omit taking notice of a circumstance that produces many disagreeable consequences, and therefore deserves a more particular degree of attention than it has hitherto obtained among modern improvers, viz. an inattention to the nature of the plants that grow
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Thus it appears that the very best soils, if allowed to run into natural grass, may, from acci-

in the margin of ploughed fields, and other waste corners of the farm. These places are often filled with docks—ragwort—thistles—and other useless or pernicious plants, which are allowed to remain undisturbed till the seeds are brought to perfection, and dispersed by the wind through every corner of the farm, where they spring up in abundance, to the infinite prejudice of every useful crop, and the ruin of the farmer, whose attempts to clean and enrich his fields are thus perpetually frustrated; for the richer and cleaner his ground is, it is the fitter for rearing these pernicious weeds with greater luxuriance. Every man, therefore, who hopes to be benefited by his labours, ought to be peculiarly attentive to see that every bad plant be cut down before it comes to flower, in every part of his farm.—One thistle—or ragweed, that escapes in a neglected corner, may produce seeds enough to stock a whole field; and the seeds are so light, that they are dispersed to an amazing distance around; so that it is of the utmost consequence that none of them escape.

This is a sort of attention that no man ought to neglect:—But the farmer, who wishes to reap the full value of his grounds, may go one step farther, and make these borders of his fields prove beneficial, instead of hurtful. With this view, he ought to dig, manure, and lay perfectly level the borders round all his inclosures, and sow it down with proper grass-seeds once for all. If it is made smooth, it will serve for a proper and agreeable walk;—if it is made rich, the grass will become so luxuriant as to admit of being cut by the scythe while the field is in corn;—and, if it is filled with proper kinds of grass, it may help to stock his fields with valuable plants, instead of pernicious weeds.

To make the farmer understand the full import of this last hint, it is necessary he should be informed, that there are

accidental causes, become stocked with a variety of bad and unprofitable plants, so as to remain for ever a coarse and disagreeable pasture. In which case an absolute restriction from ploughing, and thus giving it, at least, another chance of being stocked with better plants, or producing other more profitable crops, must be considered as an essential detriment to the public.

But this may be looked upon as a favourable case, in comparison of many others that daily occur, from an injudicious attachment to this erroneous principle.—For, although it is usually admitted as an indisputable axiom in agriculture, that, so long as ground remains in pasture-grass, it is always in an improving state,—the soil necessarily becoming richer and richer

are many valuable plants and grasses whose seeds cannot be saved without some trouble, that might be readily disseminated through the fields if the borders were filled with these.—Of this sort is the soft grass, (*Holcus lanatus*) already taken notice of—and the yarrow plant; whose seeds may indeed be collected by hand, but which would be more easily disseminated by the wind, if allowed to ripen in the borders—for it is as light and chaffy as the ragwort seeds.—If these were allowed to ripen and shed their seeds that season that the field was to be laid out for grass, it is not to be doubted but many of the plants would spring up in the fields while under pasture.

There are many other plants whose seeds can hardly be at all collected by the hand in sufficient quantities, that might, on many occasions, be planted in our fields by this means, if duly attended to.

er every year ; which is not supposed to be, in general, the case with regard to ploughed grounds ; it is therefore inferred, that those who absolutely prohibit the converting any of their grass-grounds into tillage, act a wise and patriotic part ; in so far, at least, as that they necessarily transmit to their posterity a subject richer and more valuable than they received.—Yet, I imagine, there will be found much reason to apprehend, that the truth of the axiom may be justly disputed ; and that the inference that has been drawn from it may be erroneous.

That a soil, which is naturally fertile and in good order, may be meliorated by being allowed to remain long in pasture, if it be stocked with valuable kinds of grasses, will be readily allowed. But, if it is naturally unfertile, or disposed to produce several kinds of bad and unprofitable plants, instead of becoming richer, by remaining long in grass, I am well satisfied, from numberless observations, that, in many cases, it gradually grows worse than at first, and not only affords less food for animals than at some former period, but even becomes less fitted for producing abundant crops of grain at any time to come, than it would have been if it had been sooner converted into corn ground.

Those who are disposed to be startled at the seeming novelty of this opinion, will please to recollect, that, if ground must necessarily be improved,

proved, by being allowed to remain in grass, without any regard to the state that it might be in at the time that it was first allowed to remain undisturbed by the plough, it would of necessity follow, that all wastes, commons, and other barren patches of ground that have, ever since the creation, been allowed to produce the plants that naturally spring up upon them, must be constantly improving, and becoming gradually richer and richer every day.—A circumstance that, I believe, no man in his sober senses will take upon him seriously to affirm.

But that these, in many cases, not only do not improve, but actually grow worse and worse, if certain plants are allowed to grow upon them, seems to be pretty evident from the present state of many parts of Scotland, that were deserted about the beginning of this century, in consequence of a severe famine that then prevailed in the land, and have been allowed to remain uncultivated ever since; in consequence of which they have become gradually covered with heath, and not only afford very little grass for pasture, but have become in a great measure unfit for bearing corn of any sort.—For, wherever heath abounds, there is generated, by the rotting of the leaves and roots of this plant, a peculiar kind of black earth, that is not only of itself sterile, but has also a powerful tendency to render any soil with which it

may be mixed unfertile; insomuch, that the most effectual way to improve ground upon which this plant has grown, is to bury that earth entirely by trenching, which, on many other occasions, would be rather hurtful than beneficial*.—Now, as it seems to be pretty certain

* The reader is desired to attend to this distinction.—If he is an inhabitant of a rich corn country, he will be convinced, from experience, that trenching corn-ground is in general hurtful.—If he lives in a barren moorish country, he will as naturally be inclined to believe that trenching is almost in all cases a capital improvement.—Ought not this to teach farmers, who have been confined to one district, to be cautious how they criticise, with contemptuous asperity, the general conduct of those of another district, possessing a soil of a different nature, or in a different state from their own? I hardly know a more helpless creature, or one who would deserve more to be pitied, than a mere practical farmer, who should move from a rich highly improved soil, in a good climate, to possess a farm in an unimproved country, where the soil and climate were naturally bad, and manures without his reach.—If this last observation be well founded, ought it not to make us entertain a doubt, if the practice lately introduced into some of the unimproved parts of Scotland, of gentlemen sending their sons to the most improved counties in England, to learn the practice of agriculture, will be attended with all the beneficial consequences that are at first expected to arise from it?—In an unimproved country, a farmer has numberless difficulties to encounter that are not known or dreamed of in one where agriculture has been long practised with success.—And is it in the lap of ease, and in the midst of abundance, that one learns best to suffer hardships with fortitude, and overcome difficulties by perseverance? Is it within

tain that this plant naturally tends to deteriorate the soil upon which it grows, What proof have

within the walls of a garrison that a general may best learn the art of war? or, is it not rather in the field, where dangers surround him on every hand, while opposed by a vigilant and active commander, that he learns that much prized art of destruction?—It is nearly the same with a farmer in an unimproved country.—He is surrounded with so many difficulties—meets with such powerful interruptions at every step—and must proceed so slowly and cautiously in all his operations, as would totally overcome the spirit of one who had been accustomed to live in a happier situation.—If one hopes to practise farming in these circumstances, with the smallest prospect of success, he must not only be possessed of a sagacious penetration in distinguishing with precision the nature of the different soils he may meet with, and the crops that each of these will best carry, but a solidity of judgment, and an unbiassed impartiality of mind, that may enable him to vary his practice so as to suit the nature of that soil, and make it produce perhaps the only crop that it is fitted to rear:—A species of knowledge that must be self-taught—as neither the experience of his ancestors—his neighbours—nor the best farmers in another situation, can avail him any thing.—He must likewise be possessed of a coolness of temper that is not apt to be startled at meeting with unforeseen obstructions, and an obstinate industry that persists till these are overcome, however great and numerous they may be—a versatility of genius, fitted to adapt itself at once to the circumstances that may occur, so as to seize every advantage that fortune may throw in his way—a patient forbearance, and vigilant foresight, that may perceive difficulties at a distance, so as to guard against them, before they come to press with irresistible power;—and a moderation in his desires, that can be contented with little on all occasions.

have we that there is no other plant that may be possessed of a similar destructive quality?—

And,

With all these qualities, a man, in many situations, may be reckoned fortunate, if, after a long life spent in the most vigorous exertions, and persevering industry, he can bring his fields into such order, as barely to admit of beginning to introduce some of those modes of culture that were fully established in the improved district, which was proposed as a model to him in his early years. Is it proper to send a young man who has such a rugged scene to encounter, to the smooth and fertile fields of plenty?—Is it fit to inspire his youthful mind with a taste of those sweets that he is doomed never to enjoy?—Is it wise to send one to learn to overcome difficulties, to a place where none of these difficulties ever occur?—Is not such a plan apt to inspire the youthful mind with a vain and presumptuous confidence of success, that is in danger of making it engage in chimerical plans of improvement that can never be realised--which end in disappointment and chagrin--perhaps in utter ruin and misery?

I have been induced to delineate this faithful picture, from having seen it too fatally realised in more instances than one;--and from having observed that some writers of late have exerted themselves to the utmost, to endeavour to promote such chimerical projects--It is painful to see individuals hurt by improper ideas getting possession of their mind--but it is still more painful to see a whole nation labouring under inconveniencies that are produced by this means, and not endeavour to remove them.--Thousands in Scotland are at this moment groaning in misery, in a great measure from this cause.

Those who have been accustomed to live in the regions of plenty--of industry and knowledge--who have been used to see abundant crops waving in luxuriance on their fields--who look with contempt on the unskilfulness, and laugh at what they deem the puny attempts at improvement of those

And, as it is found, that, in many parts of the country where the soil is naturally unfertile, the grafs, in a few years after the field has been allowed to remain untilled, becomes gradually more scanty than it was; and that the fields are not rendered more fit for producing corn, by being allowed to remain a long time in that state after that period, it would seem that we have

those who live in barren countries, will no doubt accuse me of prejudice, should I give it as my opinion, that, with half the genius—half the application and industry—half the knowledge—half the money—and one tenth of the time, a farmer who lives in a rich country, already forward in culture, may bring all his fields in such order as to carry onions, or any other garden-crop, before one who, in certain circumstances, undertakes to improve barren and uncultivated ground, will be able to bring it to bear tolerable crops of any kind of corn or grafs.—Yet, if I can trust to my own most attentive observation and experience, this is undoubtedly the case.

Let it not, however, be imagined, that I mean to insinuate that a farmer can gain no advantage by travelling into a country where there are more improvements than in that where he resides.—Nothing can be farther from my intention.—I would only wish to inculcate this useful maxim, that might with justice be applied to all kinds of travelling,—That it is not the young and inexperienced who can be properly instructed by this means—but those who have already made some progress in those arts or sciences that they wish to be instructed in—whose experience has taught them caution, and whose habit of attention has enabled them to select with judgment, and adopt with a wise discrimination, such particulars only as they know can be applied to their own particular purposes---and rejecting the others as useless or pernicious.

have sufficient reason to conclude, that those only who possess a soil naturally fertile, can expect that it will be meliorated merely by being allowed to remain for a great length of time without culture; and that those who possess pastures that are naturally very rich, or that do not abound with the most valuable kinds of grass, are not only guilty of great want of oeconomy with respect to themselves and families, but essentially hurt the interest of the state, by either neglecting to improve these fields by tillage themselves,—or depriving others of the liberty of doing it.—Nor are those less excusable, who, possessing fields perhaps naturally of very great value, suffer them to be over-run with a most destructive vermine, that soon convert the finest pasture into a most desert waste, and yet refuse to grant liberty to plough up these fields; which is the only certain and most oeconomical way of totally clearing a field of ants, where the situation does not admit of laying it totally under water till they be all destroyed *.

Let

* Scotland is not in general so much pestered with ants as England is; but, in some places there, this insect is so exceedingly pernicious, as to prove a most grievous pest to society;—nor are the palliative methods of eradicating these insects, usually practiced by improving farmers, by any means efficacious.

Much ingenuity has been displayed in inventing instruments for cutting up the surface of the hills, and smoothing
ing

Let us, therefore, instead of contenting ourselves on all occasions with such pastures as nature

ing the fields ;---and they have in some cases been brought to such perfection, as to effectuate this very well, at a moderate expense ;---but, after the farmer has smoothed his field, and burnt the hills, and thus, as he imagines, effectually destroyed all the vermine, and their eggs, he has the mortification to find that, in a very short time, his field becomes uneven, and, before it is sufficiently stocked with grafs, the same operation needs to be repeated.

This operation, for many reasons, is ordered to be performed in winter, and early in the spring ; for few persons choose, if possible, to lose the whole produce of the season, by doing it in summer. It is likewise imagined that, by cutting up the hills during the severe weather in winter, the intenseness of the cold freezes these tender creatures to death ; on which account this is thought to be by far the most propitious season.

But the experienced naturalist, who has studied the oeconomy of this *little people* knows that, at that season of the year, they have retired so far below the surface, as to be in no danger of being disturbed by these operations ; and have their houses too well secured, to be much incommoded by the removal of their hills, which at that time are of no sort of use to them.

A very few of them indeed may be scorched by burning the hills, if that is long delayed in the spring ;---but, as this is an active animal, and can suddenly retreat from danger to its inmost recesses, where it cannot be incommoded by the heat of the fires upon the surface, small is the benefit produced by this operation. The fires are no sooner extinguished, than they begin their labours a-fresh with redoubled assiduity, and thus frustrate the aim of the improver.

Thus, it appears that the season usually chosen for performing this operation is the most unpropitious. If ever they

ture may afford, rather study to improve those that are indifferent, by endeavouring to obtain a knowledge of such plants as might afford the most valuable pasture, and cultivating these with assiduity and care.

The inattention of the improving farmers in Great Britain to this subject has been truly amazing.—But it is hoped the attempt that has been made by the ingenious Mr. Stillingfleet, will be in time attended with the desirable effect of turning their attention to a subject of such great importance; with regard to which they will then doubtless make many valuable improve-

they are to be destroyed by cutting up the hills, the operation must be performed in summer, when the hills are their place of abode, and when many of them must be destroyed by this operation.---But, as they are so numerous, many must even then make their retreat to the bottom of their holes, and be preserved.---If this operation, however, was performed about the end of June, or beginning of July, when the young of this animal are in their vermicular and aurelia state, and near the surface, the greatest part of these young ones would be destroyed;---which would be doing something.---But, when it is considered that this creature multiplies so fast,---that some of the vermicles and aurelias would be saved by the assiduous care of the working ants; and that, of the living ants, perhaps not one hundredth part could be by this means destroyed, it will be allowed that even this operation, expensive as it must appear to be, is only a slight palliative at best;---and that no effectual cure remains so adviseable, as ploughing the field up,---or spreading a stream of water over the surface of it; which will in all cases destroy them most effectually.

improvements.—It is, however, to be feared, that, till some attempt shall be made to ascertain the particular qualities and peculiarities of the different kinds of grasses, as is pointed out in the first and following Disquisitions in this Essay, the public will be often imposed upon by specious accounts of new grasses, which may be really possessed of few valuable qualities, and may very much tend to discourage the inquirer.—This ought not, however, to prevent such as may have had an opportunity of making any observations on this subject, from communicating them to the public, as they may always be of some use in helping to augment, in a small degree, the general stock of knowledge.

For this reason, I scruple not to communicate the following remarks relating to this subject that have occurred to myself.—At the same time, I beg leave to caution the reader, as well with regard to myself as every other person who may write on this subject, to attend to what is said with some degree of diffidence; and not at once to indulge, without restraint, the pleasing ideas that may present themselves to his imagination on perusing these accounts.—For, although the writer may be as ingenuous as possible, yet the mind is so apt to be hurried forward with too much precipitancy when it contemplates prospects of this sort, that it is next to impossible he should avoid falling into some mistakes,

mistakes, that time and a more enlarged experience will afterwards discover and correct.

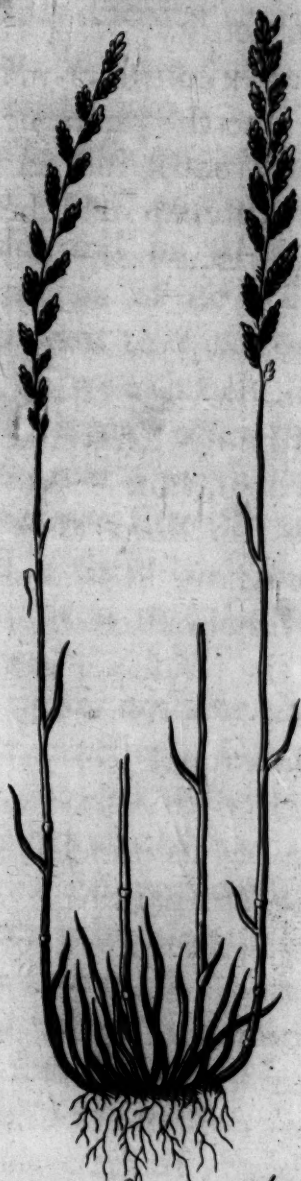
In the mean time, it were much to be wished that both the writer and reader would strenuously endeavour to discover what are the particular purposes for which any one plant could be deemed valuable, and in what respects it might be looked upon as of no value at all.—For, as there is no plant that can be alike useful on all occasions, if we lose sight of this most necessary distinction, it may often happen, that we may attempt to rear a particular plant for purposes that it never was fitted to answer; and our want of success in these trials may make it be entirely rejected, even in cases for which it was extremely proper.

But this we may rather wish for than hope to see faithfully put in practice. For the human mind is so apt to be dazzled with novelty, that, when a new plant is introduced into agriculture, like a new discovered mineral-well, it is cried up as possessing every valuable quality.—Every one is eager to experience its salutary virtues.—It is applied in all cases, and to all constitutions. But, as soon as the rage for novelty is subsided, experience soon satisfies the greatest part of those who have tried it, that they have received no benefit from it; on which account it is cried down as possessing no virtues at all, and becomes entirely neglected, except by the few



P. 155.

Tab. 2.



Pye-grass vulgo
Vol. 2.

few whose diseases it was fitted to relieve, who, in humble obscurity, reap the benefits thereof; and, after a course of many years, perhaps recommend it to the public notice for those real qualities alone that it indeed possesses.

Such has been evidently the case with regard to some plants that have been of late recommended to the attention of the public in too sanguine a manner. And such I doubt not may be the case with some of those that I here take notice of, although I have, at least, endeavoured to guard against it.

Rye-grass has been long cultivated in our fields, and it is now, in general, very well known to be but a very indifferent grass for pasture, on account of the tendency it has to send out numerous seed-stalks very early in the season, after which no animal will taste it; so that, unless it be for a very short while in the spring, when the leaves are tender and succulent, it is no longer fit for pasturage;—the stalks, after the month of May, becoming withered; so that, after that period, the field is usually covered entirely with these dead stalks, and remains during the remainder of the season with very few signs of vegetation of any sort. It is moreover but a short-lived grass, usually dying out entirely in five or six years. On both which accounts it is by no means to be recommended,

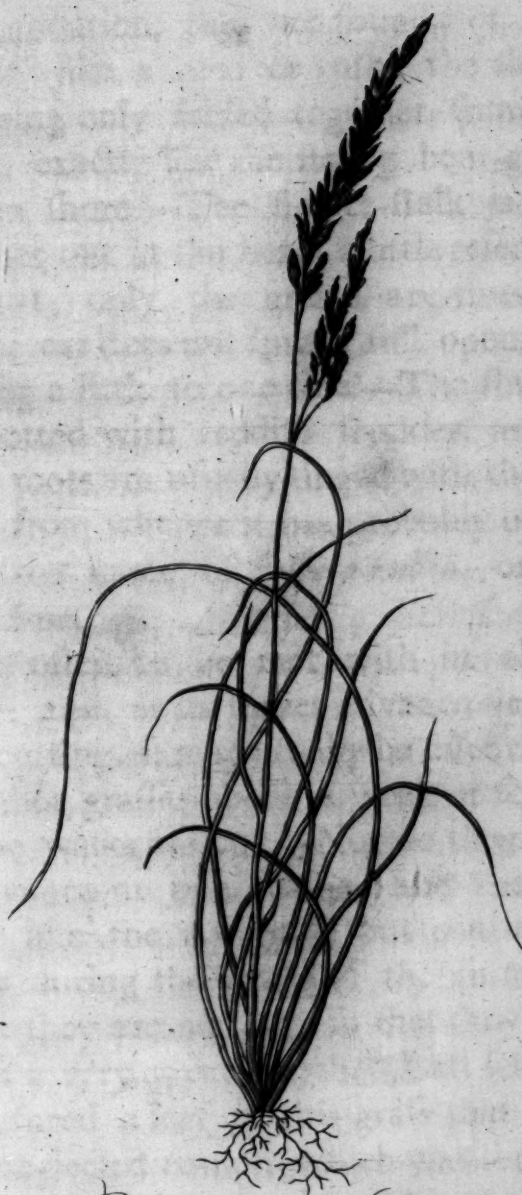
commended, in general, as a proper grass for pasturage.

All grasses that run chiefly to seed-stalks would seem to be, for the same reasons, improper for that purpose; so that our researches ought to be directed principally to discover such grasses as run chiefly to leaves, and produce but few flower-stalks.

It was this quality that first recommended the purple fescue-grass to the notice of the Writer of this Essay, and induced him to try some experiments with regard to it.

Botanists will readily know this plant.—But, for the satisfaction of the farmer, it will not be improper to observe, that although this grass is very often found in old pastures, yet, as it has but few flower-stalks, and as it is eat greedily by all domestic animals, these are seldom suffered to appear, so that it usually remains there unperceived. But it seems to be better able to endure the peculiar acrimony of the dung of dogs than almost any other plant; and is, therefore, often to be met with in dog-hills, as I call the little hills by road-sides, where dogs usually piss and dung; and as it is allowed to grow there undisturbed, the farmer may have an opportunity of examining the plant, and becoming acquainted with its appearance.

The leaves are long and small, and appear to be roundish, something like a wire. But, upon



Purple Fescue Grass
Vol: 2.



on examination, they are found not to be tubulated, like a reed or rush; the sides of the leaf being only folded together from the middle rib, exactly like the strong bent-grass upon the sea shore.—The flower-stalk is tall, and branches out in the head, a little resembling the wild oat; only the grains are much smaller, and the ear does not spread full open, but lies bending a little to one side.—The stalks are often spotted with reddish freckles, and the top of the roots are usually tinged with the same colour; from whence it has probably obtained its distinctive name of *Festuca rubra*, or red (purple) fescue.

It is often to be met with in old garden-walks; and, as its leaves advance very quickly after cutting, it may usually be discovered above the other grasses about a week or fortnight after the walks are cut.—Nor do they seem only to advance at one season, and then stop and decay like the rye-grass, but continue to advance during the whole of the summer, even where they are not cut, so that they sometimes attain a very great length. Last season, 1774, I measured a leaf of this grass that sprung up in a neglected corner, which was four feet and four inches in length, although not thicker than a small wire.—It is unnecessary to add, that these leaves naturally trail upon the ground; unless where they meet with some accidental support;

support; and that if any quantity of it is suffered to grow for a whole season without being eat down or cut, the roots of the leaves are almost rotted by the overshadowing of the tops of the other leaves before the end of the season.

This is the appearance and condition of the plant when in its native situation; as it is seldom discovered but in pretty old pastures.—And as it in that state carries only a very few seed stalks, it was with some difficulty that I could collect a small handful of the seed, which I carefully sowed in a small patch of garden-mold, to try if it could be easily cultivated.—It came up as quickly as any other kind of grass, but was at first as small as hairs;—the leaves, however, advanced a-pace, and were, before autumn, when the grain with which they had been sowed was cut down, about sixteen or eighteen inches in length; but, having been sowed very thin, it was necessary to pick out some other kinds of grass that came up amongst it, lest it might have been choaked by them.—Early next spring it advanced with prodigious vigour, and the tufts that were formed from every seed became exceeding large, so that it quickly filled the whole ground. But now the leaves were almost as broad as those of common rye-grass, and the two sides only inclined a little towards one another from the midrib without any appearance of roundness.—In due time
a great

a great many seed stalks sprung out, which attained very nearly to the height of four feet, and produced feeds in abundance, which may be as easily sated as those of common rye-grass.

The prodigious difference between the appearance of this plant in its native and cultivated state amazed me;—but it was with a good deal of satisfaction that I found that there would be no difficulty in procuring seeds from it, which I had much doubted of at first. It would seem that nature hath endowed this plant with a strong generative power during its youth, which it gradually loses as it advances in age, (for the difference perceived in this case could not be attributed to the richness of the soil); and that, on the contrary, when it was old, the leaves advanced with an additional vigour, in proportion to the declining strength of the flower-stalks. For the leaves of the young plant seldom exceed two feet, whereas numbers of the old leaves were near four feet in length.

From these peculiarities in the growth of this plant, it would seem to promise to be of great use to the farmer, as he could reap from a field of it, for the first two or three years, as great a weight of hay as he could obtain from any of the culmiferous grasses; and if he meant afterwards to pasture it, he would suffer no inconveniencies from the flower-stalks; and the succulent leaves that continue to vegetate with
vigour

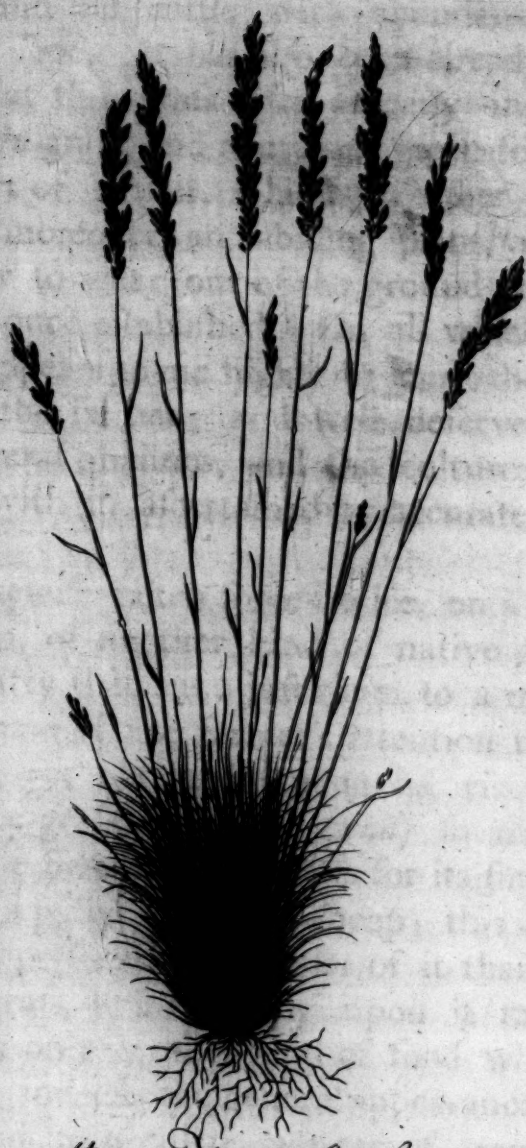
vigour during the whole summer, would at all times furnish his cattle with abundance of wholesome food. It has also been already remarked, that this grass rises as early in the spring as rye-grass, and continues green for the greatest part of winter, which the other does not.—It is moreover an abiding plant, as it seems never to wear out of the ground where it has been once established. On all which accounts, it appears to me highly to merit the attention of the farmer; and well deserves to have its several qualities, and the culture that best agrees with it, ascertained by accurate experiments.

I have likewise taken some notice, on a former occasion, of another kind of native grass of this country that has a just claim to a more particular share of the farmer's attention than it has ever yet obtained among us, viz. the sheeps fescue-grass, (*Festuca ovina*) so much praised by the Swedish naturalists for its singular value as a pasture-grass for sheep; this animal being represented as fonder of it than of any other grass, and fattening upon it more quickly than on any other kind of food whatever. And, indeed, the general appearance of the plant, and its peculiar manner of growth, seem very much to favour the accounts that they have given us of it.

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Sheep's Fescue Grass
Vol: 2 .

This plant is of the same family with the former, and agrees with it in several respects; although they may be easily distinguished from one another.—Its leaves, like the former in its natural state, are always rounded, but much smaller; being little bigger than large horse-hairs, or swines bristles, and seldom exceed six or seven inches in length. But these spring out of the root in tufts, so close upon one another, that they resemble, in this respect, a close hair-brush more than any thing else that I know; so that it would seem naturally adapted to form that thick short pile of grass, in which sheep are well known chiefly to delight.—Its flower-stalks are numerous, and sometimes attain the height of two feet; but are more usually about twelve or fifteen inches high.

Upon gathering the seeds of this plant, and sowing them as the former, it was found that they sprung up as quickly as any other kind of grass; but the leaves are at first no bigger than a human hair.—From each seed springs up one or two of these hair-like filaments, that in a short time send out new off-sets, so as quickly to form a sort of tuft, which grows larger and larger till it at length attains a very large size, or till all the intervals are closed up; and then it forms the closest pile of grass that it is possible to imagine.—In April and May it pushed forth an innumerable quantity of flower-stalks, that af-

forded an immense quantity of hay; it being so close throughout, that the scythe could scarcely penetrate it. This was allowed to stand till the seeds ripened; but the bottom of the stalks were quite blanched, and almost rotted for want of air before that period.

This was the appearance that it made the first year after it was sowed: But I have reason to think, that, after a few years, *it* likewise produces fewer seed-stalks, and a greater quantity of leaves than at first. But, however that may be, it is certain, that if these are eat down in the spring, it does not, like rye-grass, persist in a continued tendency to run to seed; but is at once determined to push forth an abundance of leaves, without almost any stalks at all *. And as all domestic animals, but more especially sheep, are extremely fond of this grass, if they have liberty to pasture where it grows, they bite it so close as never to suffer almost a single seed-stalk to escape them; so that the botanist will often search in vain for it when he is treading upon it with his feet.—The best way to discover it in any pasture is, to search for it in winter, when the tufts of it may be easily distinguished

* From this peculiarity it necessarily happens, that, if sheep are allowed to pasture on this grass in the spring, few or no seeds can be expected from it that season: Plants intended for seed ought, therefore, to be preserved carefully from cattle or sheep in the winter or spring.

guished from every other kind of grass by their extraordinary closeness, and the deep green colour of the leaves.

It seems to grow in almost any soil, although it is imagined, that it would flourish best in a light spungy soil, as it can evidently live with less moisture than almost any other kind of grass; being often seen to remain in the fods that have been employed for coping stonedikes, after all the other grasses that grew in them have disappeared. It is likewise frequently found on poor barren soils, where hardly any other plant can be made to grow at all, and on the surface of dry worn out peat-moss, where no moisture remains sufficient to support any other plant whatever.—But in neither of these situations does it thrive; as it is there only a weak and unsightly plant, very unlike what it is when it has the good fortune to be established upon a good soil; although it is seldomer met with in this last than in the former.

From this last circumstance it appears, that those who imagine that a plant is always found naturally on that soil in which it most delights, and where it will grow to the utmost perfection, may be very often deceived;—as some particular circumstance relating to the œconomy of the plant, may prevent it from being able to establish itself in the soil in which it would thrive better than any where else, if it could

have overcome these obstacles that prevent its establishment there ;—and that, on the contrary, it may naturally appear on other less favourable soils, merely because it does not in these meet with the same obstructions to prevent its establishment there.—This, I am satisfied, is exactly the case with regard to this plant. For, as its first shoots are extremely weak, it is then easily surmounted by almost every other kind of plant.—And as the seeds of other kinds of grass that may chance to be lodged in a rich soil rush up with vigour, and soon cover the whole surface of the ground, the few seeds of this kind of grass that may chance to be carried into these fields, are hardly allowed to vegetate before they are entirely smothered by the other stronger grasses.

But upon such barren soils as are unfit to rear any other kinds of grass, the seeds of this plant are allowed to come up, and the plants to grow without meeting with the same obstruction; and there they establish themselves from this cause, although the soil is incapable of affording them afterwards that abundant nourishment that is necessary to rear the plant to perfection.

I chose to remark this peculiarity relating to this particular kind of grass, not only to satisfy the reader of the necessity of attending to many seemingly trifling circumstances relating to the œconomy of particular plants, but also to guard against a prejudice that might arise in the minds

minds of some people, who might chance to take notice of this plant in the situation that I have now described. Where, finding it so unlike that thriving state in which I have represented it in other passages of this article, they might be disposed to doubt the truth of what I have alledged.—But, if they would satisfy themselves in this respect, let them either transplant a few tufts from these barren soils into a good garden mold, or sow the seeds there, and guard against their being choaked with others, and they will soon see how different the one plant is from the other.

From this fact we may likewise draw the following very useful corollary :—That, seeing it is so difficult to meet with a good rich soil in such circumstances as to permit this plant naturally to establish itself in it,—and seeing we have very great reason to imagine that this is one of the most valuable grasses that our country produces, we have, from this single instance, the clearest proof that could be wished for of the impossibility of obtaining, on all occasions, the finest pasture, by allowing nature to operate without any assistance.—Heaven has endowed man with reason, that, by the exercise thereof he may promote his own felicity ; and hath subjected many of those objects that may minister to his wants to particular natural inconveniencies that it is in his power to remove, and thus render them

them more eminently useful to him;—of which this may be looked upon as one conspicuous example.—For, by sowing the seeds of this plant, and sowing them in sufficient quantities on a rich soil properly prepared, the great number of plants that are thus established before the seeds of others can be brought to the field and made to vegetate, effectually cover the whole surface, and exclude the admission of others; so that we may thus have a full crop of this valuable plant upon a soil in which nature could hardly ever have established it, and in which alone it can ever arrive at its ultimate perfection.

It may not, however, be improper to remark, as one of the excellencies of this plant, that it will grow upon such soils as hardly any other good kind of grass could live upon. And although the farmer cannot from these expect a crop nearly equal to what he will reap from his richer fields, yet it is no small convenience for him to have a plant with which he can at once cover his most barren spots, which, without this care, might have remained bare for many years.

I will not here repeat what has been already said about the particular property that this plant possesses of continuing green all winter, nor point out the benefits that the farmer may reap from this valuable quality.—He need not, however, expect to find any verdure in winter on such plants as grow upon the loose mossy
soil

foil above mentioned. For, as the frost in winter always hoves up the surface of this foil, the roots of the plants are so lacerated thereby, as to make them remain for some time in the spring to all appearance dead.—Nor will he often perceive much verdure in winter upon those plants that grow upon poor hungry soils, which cannot afford abundant nourishment to keep them in a proper state of vegetation at all times.—But such plants as grow on earthen dikes, which usually begin to vegetate with vigour when the autumnal rains come on, for the most part retain their verdure at that season almost as well as if they were in good garden-mold.

I have been very particular with regard to this plant; because, in so far as my observations have yet gone, it promises on many accounts to make a most valuable acquisition to the farmer; and, therefore, justly demands a very particular share of his attention.—

Another very valuable pasture-grass, is what I would call the vernal soft-grass,—the *Holcus lanatus*, or creeping soft-grass of Hudson.—No grass makes a more beautiful appearance in the spring than this does.—The lively verdure and closeness of the pile, and the softness and succulent richness of the leaf, convey the most pleasing idea to the mind that could be desired; and seem to give it a just title to be considered

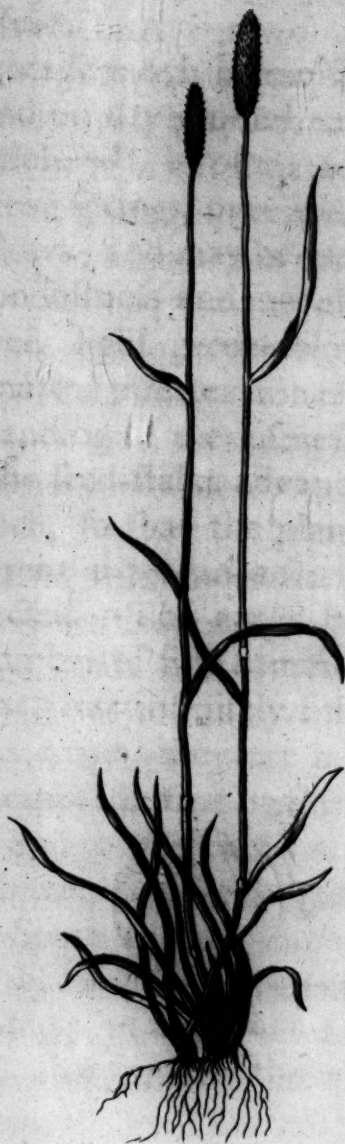
ed as one of the most valuable kinds of meadow-grasses*.

It delights so much in moisture, that it is seldom found on dry ground, unless the soil is exceeding rich.---It is often found upon those patches near springs, over which the water frequently flows; and may be easily known by the uncommon softness and succulence of the blade; ---the lively light green-colour of the leaves, and the matted intertexture of its roots. But, notwithstanding of the softness of its first leaves, ---when the seed-stalks advance, they are rough to the touch, so that the plant then assumes a very different appearance from what we would have expected.---The ear is branched out into a great number of fine ramifications somewhat like the oat, but infinitely smaller; and, when the seeds are ripe, they are enveloped in a soft kind of membrane that makes them adhere to the stalk, and to one another, after they are separated from it, as if they were intermixed with cobweb.---Some of these seeds were saved and sowed by themselves, which came up extremely well;---but, on account of that filamentous membrane that makes them adhere to one
ano-

* I do not here mean to class this plant among the *Poa* tribe of grasses, which, in English, have no other name but *meadow-grass*.----It is only meant to say, that it is one of the most valuable kinds of grass that naturally grow in our meadows.



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Bulbous Foxtail grass..
Vol. 2.

another, it is extremely difficult to get them to spread readily in sowing: And, as the seed is small, and adheres very closely to the stalk, it is difficult to get it separated from thence. On both which accounts, it seemed to me, that it would not be easy to cultivate it artificially.— But, if any contrivance could be got to clean the seeds at a moderate expense, a very small quantity of these would probably be sufficient to stock a rich meadow with it. For, although it were sowed very thin, it spreads so fast by its running roots, as would in a short time stock the field abundantly.

Another plant that promises, on some occasions, to afford a valuable pasture-grass, is the bulbous foxtail-grass;—the *Alopecurus bulbosus* of Hudson.—Its leaves are broad, soft, and succulent; and feel a little woolly to the touch. These spring out in great abundance from a strong, firm, matted kind of root; and if they are cut over at any time during summer, they very quickly advance again, so as to get above almost all the other kinds of grasses.—The seed-stalk is long, and very strong, being between four and five feet high, and is crowned with a round brush-like soft head, which consists almost entirely of light scaly-like seeds.—But, like the purple fescue, it sends out but very few flower-stalks; so that a crop of it allowed to come to
feed,

seed, assumes but a very thin, straggling, and unsightly appearance.—In other respects, it much resembles the whole plant lately introduced from America, known by the name of Timothy-grass,—only, its leaves are softer, and of a darker green-colour,—and the head is likewise soft and scaly, instead of being hard, and, in some degree, prickly; as is the case with Timothy-grass. The seeds also are exceeding soft and chaffy, very unlike the firm round seeds of Timothy-grass.

It seems to delight chiefly in a moist soil; and, therefore, promises to be only fit for a meadow-pasture-grass. The quality that first recommended it to my notice, was the unusual firmness that its matted roots gave to the surface of the ground, naturally soft and moist, in which it grew; which seemed to promise that it might be of use upon such soils, chiefly in preventing them from being much poached by the feet of cattle which may pasture upon them.—Mossy soils * especially are so much hurt by poaching, that any thing that promises to be of use in preventing it, deserves to be attended to.

The seeds were sowed in garden-mold, and came up very well; but I have not yet obtained a sufficient quantity of these to try how it would

* By mossy soils is here meant such as contain turf or peat. The Irish would call these bogs.

TO THE EDITOR OF THE

BRITISH MUSEUM



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Great Meadow Grass

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would answer for the purpose that I had chiefly in view when I thought of cultivating it. I have remarked that the stalks of this plant are extremely tough and flexible when made into hay, so as to be better fitted for making ropes for fastening thatch with, than any other plant I have yet seen.

If my experience with regard to Timothy-grass had been sufficiently extensive as to enable me to speak of its qualities with certainty, I would have here enumerated them.—But, having found no reason, from the trials that I made of it, to think that it promised to be of very great value; and, being sensible that the attention of the public was already directed towards it, I left others to make the necessary experiments with regard to it.—And I only mention it here, lest some might have thought it an omission.

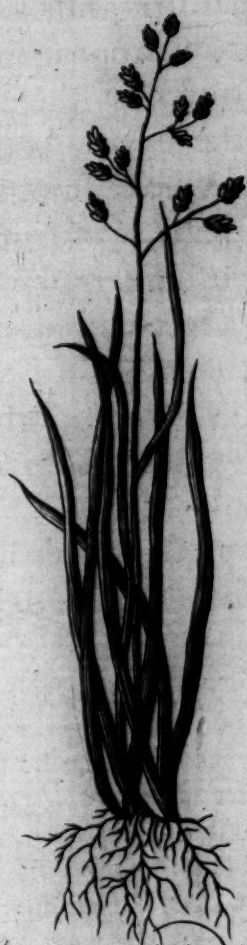
The great meadow-grass,—the *Poa pratensis* of Hudson, seems to approach in many respects to the nature of the purple-fescue, only that its leaves are broader, and not near so long; being only about a foot or sixteen inches at their greatest length.—Like it, it produces few seed-stalks, and many leaves, and is an abiding plant.—But I have not yet had an opportunity of trying the effects of culture upon it;—having only sowed the seeds of it for the first time last season.

The creeping meadow-grass,—the *Poa repens* of Hudson, seems to be the most valuable grass
of

of any of this genus.—Its leaves are firm and succulent,—of a dark Saxon-green colour; and grow so close upon one another as to form the richest pile of pasture-grass.—The flower-stalks, if suffered to grow, appear in sufficient quantities; but the growth of these does not prevent the growth of the leaves; both advancing together during the whole summer, and when the stalks fade, the leaves continue as green as before*.—Its leaves are much larger, and more abundant than the common meadow-grass, *Poa trivialis*; and, therefore, it better deserves to be cultivated.—This description is taken from the plant in its native state.—How it may be altered by culture I know not.

I have attempted to save some seeds of this plant for two years successively, but have never been

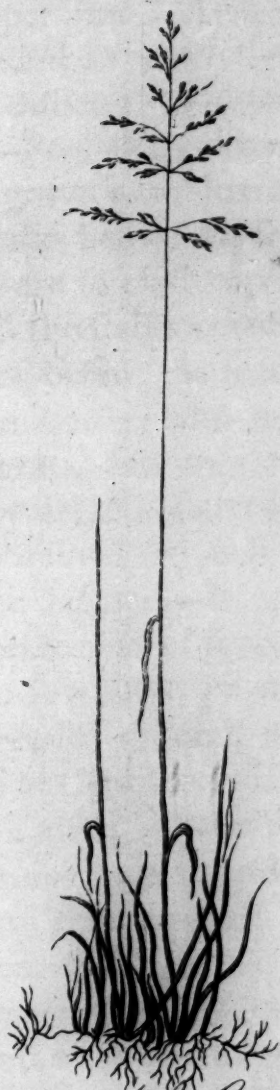
* Culmiferous grasses might be divided into two general classes for the purposes of the farmer, that it might be of use for him to attend to; viz. 1st, Those which, like the common annual kinds of corn, run chiefly to seed-stalks; the leaves gradually decaying as these advance towards perfection, and become totally withered, or fall off entirely, when the seeds are ripe. Rye-grass belongs to this class in the strictest sense. To it likewise may be assigned the vernal-grass, dogs-tail-grass,---and fine bent-grass. 2^d, Those whose leaves continue to advance even after the seed-stalks are formed, and retain their verdure and succulence during the whole season, as is the case with the Fescue, and *Poa* tribe of grasses, whose leaves are as green and succulent when the seeds are ripe and the flower-stalks fading, as at any other time.



Creeping Meadow Grass

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Creeping Soft Grass
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been able to get them in any other way than by gathering with the hand; which is a troublesome and tedious operation: And, if the season is rainy, or the ground on which the grass grows is very rich, it is difficult to obtain the seeds, even in this way.—For, as the leaves continue, in these cases, to grow with luxuriance, they overtop the seed-stalks before the seeds are ripe: And, as the leaves are so close upon one another, both them and the stalks are often rotted in these circumstances, before the seeds are ripe.

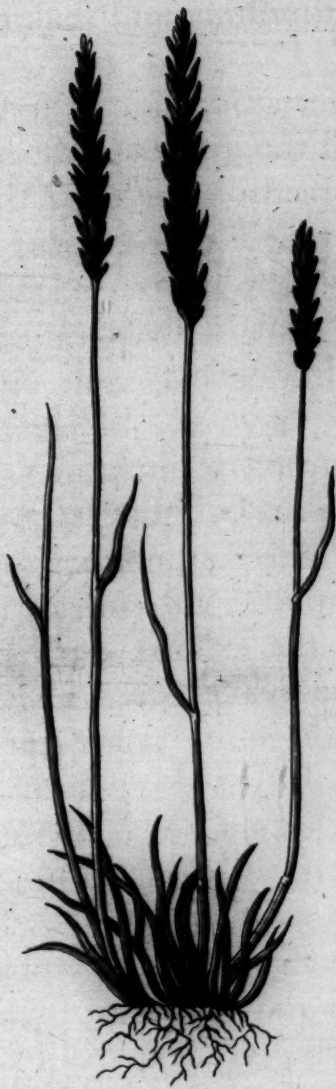
This is perhaps one of the most valuable kinds of pasture-grass, and therefore merits a more than ordinary degree of attention to try if the seeds can be obtained in such quantities as to be useful to the farmer.—It appears to me, that the only probable way of succeeding in this attempt will be, to sow some of the seeds upon a clean sharp piece of ground, naturally dry, and not very rich at the time. If it were once established on such a soil, it would carry abundance of seeds every season, and there would be little probability that it would be rotted before these were ripe. But, as the leaves are for the most part higher than the stalks before the time of cutting; and, as these leaves are extremely succulent when cut, it will be proper to make the whole of this scanty crop into hay,—put it up in a rick till the spring, and then thresh it out.—The seeds are light and chaffy, and are neither

ther easily separated from the stalk, nor disintangled from the hay; so that care must be taken that threshing and shaking are carefully performed.

These observations are in some measure applicable to all the grasses of the *Poa* tribe.

I have already mentioned the vernal grass, and the use that I apprehended it might be of for giving a rich flavour to milk or butter:—But if, upon trial, it shall not be found to possess that quality, it does not, on any other account that I have as yet observed, much deserve the attention of the farmer.—As a pasture-grass, it seems to be subjected to all the inconveniencies of the common rye-grass; because, like that, it runs almost entirely to flower-stalks very early in the season; during the formation of which, the leaves are totally exhausted, so that the cattle must either eat these or want entirely.—Its leaves do indeed spring up after it is cut over, or eat down by cattle, and remain green pretty late in autumn; but it does not seem that ever these will yield a very abundant crop; so that it would probably require either to be cut and consumed green, or made into hay like rye-grass, if it should ever be deemed worth the cultivating—It may, however, be remarked in its praise, that it grows with luxuriance upon a much more indifferent soil than many other kinds of grass; on which account,

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Vernal Grass
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Crested Dogtail Grass.

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count, it might be on some occasions of great value.

Nearly the same thing may be said of the crested dogs-tail-grass, *Cynosurus cristatus*, commonly known in Scotland by the name of Windlestraw-grass, excepting that it possesses no uncommon taste or smell; but, like the former, it runs chiefly to stalks, and has but few leaves, which are short, and remain green pretty late in winter.—I have gathered some of the seeds of both of these, and shall soon be able to speak of them with a greater degree of certainty.

I am well acquainted with the fine bent-grass so much recommended by Mr. Stillingfleet in his Essays; but think it is by no means of such uncommon value as he seems to imagine.—Cattle and horses will eat it when pinched for food; but it is with difficulty they can be kept upon a field where this grass chiefly abounds; so that they will leave it if they can, and go to other fields much barer, that contain more palatable grasses; nor do they almost ever grow fat upon it; and therefore, I would not recommend it to the improving farmer. Nor does it appear to me, that the flote-fescue is of half the value that he has been made to believe.

I was also at pains to get some seeds of the American Cocks-foot-grass * that was lately advertised

* *Dactylus Americanus*.

vertified as of inestimable value. Like all the other grasses of this tribe, it is a strong robust plant.—Its leaves are broad, firm, and roughish, of a light green colour, but neither are very long nor close upon one another;—its stalks rise thin and straggling;—are strong, and feel rough to the touch,—rising to the height of near four feet on a good soil.—It does not promise either to yield an abundant crop of hay, nor a close pile for pasture;—nor does its appearance seem to indicate that it would be of the most palatable sort for cattle.—The quantity I have is too small to permit me to speak with great certainty.—It seems to be a plant that would require a dampish soil.

All these belong to the class of culmiferous plants, and are what botanists call *Gramina*, or grasses properly so called. But, as there are many other plants that may be employed by the farmer for the same uses as these, it is by no means necessary that he should confine himself to this class of plants alone, or be directed in his researches by any other rule excepting that of utility.—The following plants, therefore, are pointed out to him, as promising to be of some use on particular occasions.

Milk-vetch,—liquorice-vetch,—or milk-wort, as it is differently called,—the *Astragalus glycyphyllos* of Hudson, is a plant common in every part of the island; although it has never yet,
that



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Tab. 1.

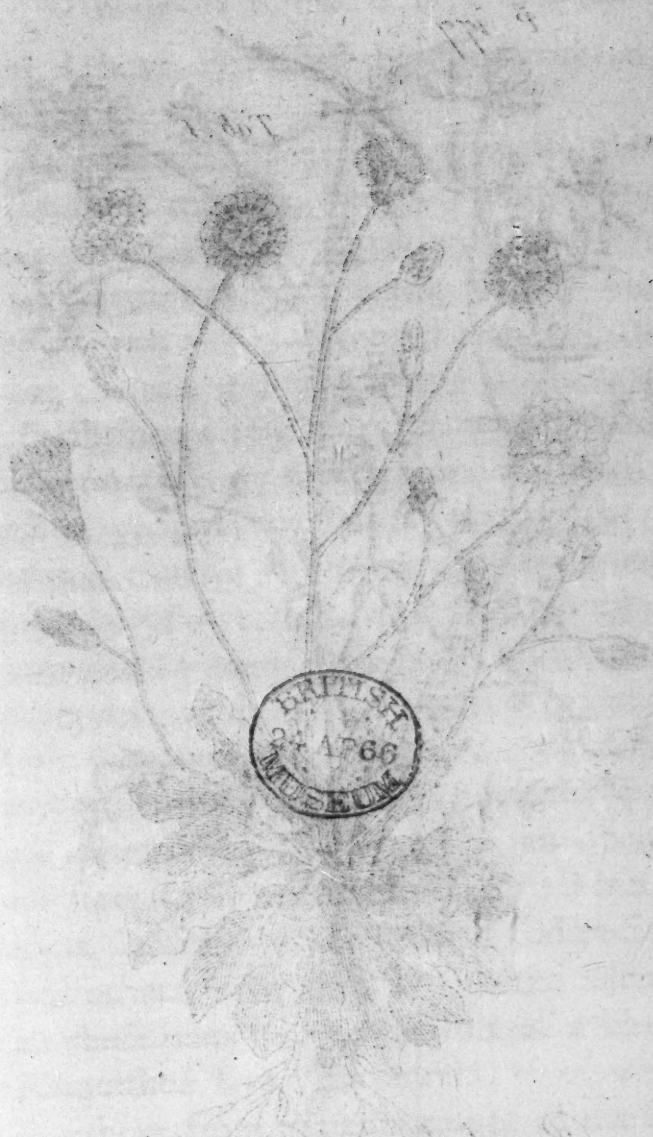


Rough leaved Dandelion.

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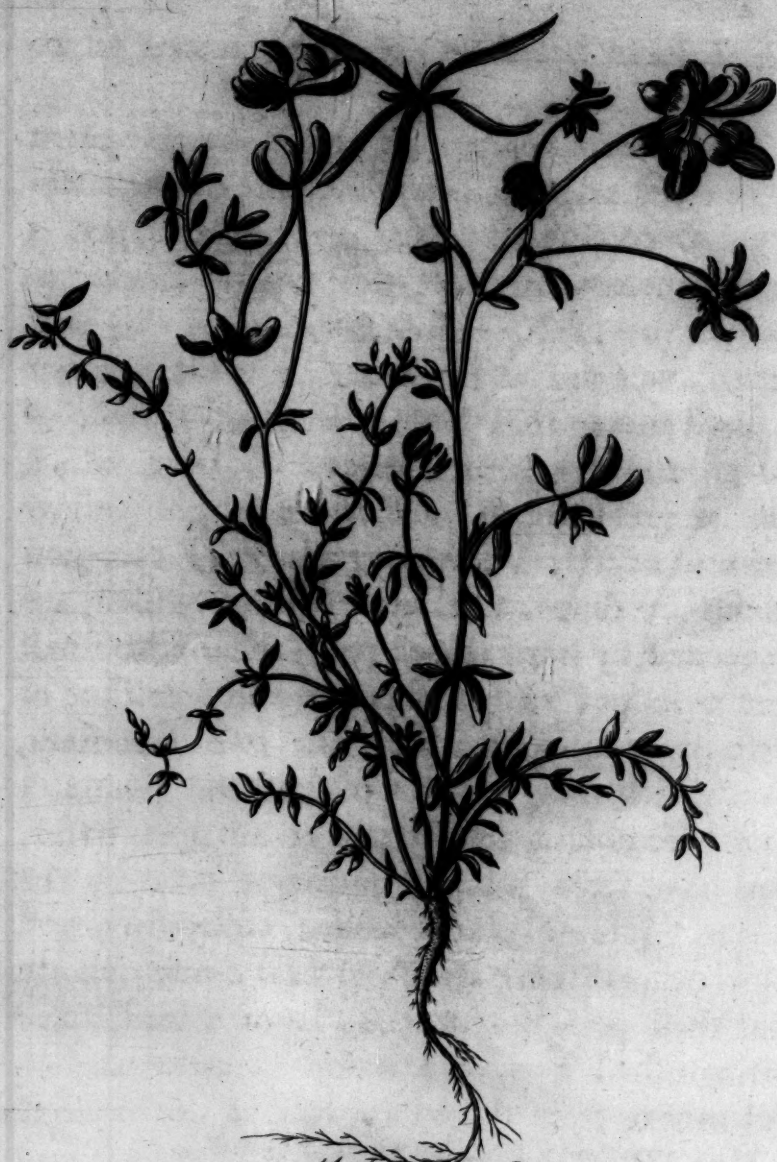
1007



Ranunculus acris
L.

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Milkwort.

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that I have heard of, been attempted to be cultivated.

The general appearance of this humble plant is, in some respects, very like that of the common white-clover; altho' its leaves, upon a nearer examination, are not exactly similar to those of this plant.—From the top of the root there comes out in the spring a great number of small shoots that spread along the surface of the ground every way around it; from which arise a great many clusters of bright yellow flowers, exactly resembling those of common broom in shape, size, and colour; which are succeeded by hard round pods, filled with small kidney-shaped seeds. And, as three or four of these pods usually adhere to one foot-stalk, from which they spread open at the points, a little resembling the fingers of an open hand; they have from this circumstance been by the vulgar, in some places, called ladies-fingers *, while others, more struck with the resemblance that these pods bear to the foot of a bird, have distinguished it by the name of crow-toes †; and others, from the appearance of the blossom,

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and

* The reader will please to observe, that this is not the plant which properly bears the English name of Ladies fingers—the *Anthyllis* of botanists.

† Neither is this the plant that bears the name of Crowfoot properly in English—which is the *Ranunculus* of botanists.

and the part where the plant is found, have called it *feal* †, or, by corruption, *fell* broom.

It is found plentifully almost every where in old grass-fields; but, as every species of domestic animal eats it, almost in preference to every other plant, it is seldom allowed to come to the flower in pasture-grounds, unless where they have been accidentally saved from the cattle for some time; so that it is only about the borders of corn-fields, or the sides of inclosures to which cattle have not access, that we have an opportunity of observing it. As it has been imagined that the cows which feed on these pastures where this abounds, yield a great quantity of rich milk, the plant has from that circumstance obtained its most proper English name of milk-vetch.

But the circumstance that first recommended it to my notice was, the having observed that it grows and flourishes in poor barren ground, where almost no other plant can be made to live.—I have seen it in the midst of a barren moor,

† If any sod is dug from the surface of the ground, in which a root of this plant chances to be, and it be put upon the top of a sunk-fence, wall, or in any other place that is not entirely destitute of moisture, the plant does not die, but sends out annually great tufts of flowers which were not perhaps observed on the pasture from which the sod (*feal*) was dug, which probably first suggested the idea of that name.

moor, where the soil was so poor that even heath, or ling (*erica communis*;) could hardly grow,—and upon bare obdurate clays, where no other plant could be made to vegetate; in-somuch that the surface remained entirely uncovered, unless where a plant of this kind chanced to be established; yet, even in these unfavourable circumstances, it flourished with an uncommon degree of luxuriance, and yielded as tender and succulent, though, not such abundant shoots, which assumed as fine a verdure as if they had been reared in the richest manured fields.—I have likewise seen it in dry and barren sands, where almost no other plant could be made to live; and there also it sends out such a number of healthy shoots all round, as cover the earth with the closest and most beautiful carpet that can be desired.

The stalks of this plant, as has been said, are weak and slender, so that they spread upon the surface of the ground, unless they are supported by some other vegetable. In ordinary soils, they do not grow to a great length, nor produce a great many flowers; but, in richer fields, the stalks grow to a much greater length,—branch out a good deal, but carry few or no flowers or seeds; and, as I first took notice of it only on poor soils, it was purely with a view to pasture that I first resolved to cultivate it; and, with this intention, sowed it with my ordinary hay-

feeds, expecting no material benefit from it till I desisted from cutting my field; but found myself agreeably disappointed, as it grew the first season as tall as my great-clover, and formed the finest hay I ever saw; it being scarce distinguishable from Lucerne, but by the slenderness of the stalk, and proportional smallness of the leaf.

It is nearly allied to Lucerne in its botanical characters; and resembles that valuable plant in many other respects. Like that, it is perennial,—sends down a long root to a great depth in the soil, which is at first small, and gradually increases with age, till it at length becomes of a very considerable size; so that it is several years after it is first sowed before it attains its full perfection: But, when it is once established, it probably remains there for a prodigious number of years in full vigour, and produces annually a great quantity of fodder. In autumn 1773, I cut the stalk from an old plant of it that grew in a very indifferent soil; and, after having dried it thoroughly, found that it weighed fourteen ounces and a half. Like Lucerne, it is never affected with the severest droughts that we experience: But it does not resemble that plant in delicateness of constitution, as it thrives in the stiffest clays, and is able to stand its ground among grass, or any other weeds.

As

As this plant only produces seeds in abundance upon poor hungry soils that could hardly afford nourishment to any other, and as the stalks spread out close upon the surface of the ground, it seems to me, that the greatest bar to the cultivating thereof will be the difficulty of obtaining the seeds in abundance; as in these circumstances they must always be gathered by the hand.—But, as it is an abiding plant, those who have such soils as most stand in need of having plants of this sort sowed upon them, may be at a little trouble and expense to get them at once *properly* laid down with this grass, as it will be only once that they will need to do it. It is possible, that future experience may discover some easier way of procuring the seeds than hath as yet occurred to me.

The stalks of this plant die down entirely in winter, and do not come up in the spring till the same time that clover begins to advance; so that it can never be of use but as a summer-pasture:—Neither does it advance very fast after it is cut down, or eat over, even in summer.—But the great closeness of the shoots may probably counterbalance that defect.

I have seen another species of the *astragalus* with an erect stalk, that naturally grows upon dampish soils; but have had no opportunity of making particular observations upon it; nor have as yet been able to procure any of its seeds.

feeds.—It seems more likely to answer well for hay than this does.

The common yellow vetchling, *Lathyrus pratensis*, or everlasting-tare, might likewise be on many occasions cultivated with profit by the farmer.—It grows with great luxuriance in stiff clayey soils, and continues to yield annually, for any length of time, a great weight of forage, which is deemed to be of the very best quality. And, as it is equally fit for pasture or for hay, the farmer would have it in his power to apply it to the one or the other of these uses, at any period that might best suit his convenience.—It is likewise attended with this farther advantage, that, as it continues to grow with equal vigour in the end of summer as in the beginning thereof, it would admit of being pastured upon in the spring, till the middle, or even the end of May, should it be necessary, without endangering the loss of the crop of hay; which cannot possibly be done with rye-grass, or any other plant usually cultivated by the farmer, except clover; which is equally unfit for early pasture or for hay.—This plant would be the more valuable to the farmer, as it grows to the greatest perfection on such soils as are altogether unfit for producing sain-foin; the only plant hitherto cultivated that seems to possess qualities approaching to those of this one.

It



Yellow Vetchling.
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It must, however, be acknowledged, that the difficulty of procuring seeds of this plant in abundance, must be a very great bar to the general cultivation thereof. For, altho' these ripen very well in our climate, yet the quantity that it produces is so inconsiderable, and the difficulty of getting them separated from the pod is so great, as to make it necessary to gather them by the hand; in which way the quantity obtained must be very trifling.—To counterbalance this defect, however, it may be observed, that it is not only an abiding plant, which never leaves the ground where it has been once established, but that it also encreases so fast by its running roots, that a very few plants at first put into a field, would soon spread over the whole, and stock it sufficiently.—If a small patch of good ground is sowed with the seeds of this plant in rows about a foot distance from one another, and the intervals be kept clear of weeds for that season, the roots will spread so much as to fill up the whole patch next year; when the stalks may be cut for green fodder, or for hay. And, if that patch were dug over in the spring following, and the roots taken out with the hand, it would furnish a great quantity of plants, which might be planted in such fields as you meant to have filled with this, at the distance of two or three feet apart; which would probably there take root,
and

and quickly over-spread the whole field.—And, as there might always be a sufficient quantity of the roots left to fill again the patch from whence they are taken, it would be ready to furnish a fresh supply the next season, and might thus continue to serve as a nursery for ever afterwards.

It appears to me, that this would be the most likely method of propagating this plant with ease; but I have not as yet had sufficient experience thereof to be able either to tell precisely the expense of it, or to answer positively for the success thereof in all cases.

The flowers of this kind of vetch-grow in a wide spike, having pretty long foot-stalks;—are of a bright yellow colour, and are succeeded by very flat pods, which are black when ripe, that are so tough, and adhere so firmly to one another, that they are with difficulty opened;—the seeds are flat,—small, of a dark greenish grey,—and irregular figure;—round for the most part.

The common blue tare is in many respects of seemingly equal value with the former.—This carries a large close spike of bright cerulean coloured flowers, which are succeeded by smooth white pods, filled with round flattened blackish seeds, which rattle in the pods when ripe.—The leaves of this plant are much smaller and more divided than those of the former; the stalks are likewise smaller, and grow to a much

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Blue Tare
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much greater length.---It produces a much greater quantity of seeds; but the small birds are so fond of them, that, unless the field is carefully guarded, few of the seeds are allowed to ripen; but, if they were guarded from that enemy, they might be easily propagated.---It seems to flourish upon the same soil with the former,---is equally well liked by cattle, and will probably afford a more nourishing hay, on account of the quantity of seeds it contains: But, as the stalks come up more thinly from the root, and branch more above, it would not seem of itself to be so well fitted for a pasture-grass as the former. If it were intermixed with other plants that made the pile close at the bottom, it might probably greatly encrease the value of the pasture; and would put it in the power of the farmer to cut a very fine crop of hay from his fields at any time that he might so incline.

It is often found growing among the corn in stiff soils badly dressed, where its roots are allowed to remain; and is known in some parts of Scotland by the name of *horse-pease*.

But, of all the plants of this tribe that have occurred to me, none seem to equal the purple everlasting, or bush vetch, (*Vicia sepium*), for pasture.

The roots of this plant spread on every side a little below the surface of the ground like both

the former; from which arise many stems in the spring of the year, quite close by one another. And, as these have a broad tufted top, covered with many leaves, it forms a pile, even without any other plant, as close as could be desired.—It does not grow to a very great height; and, as it springs up very quickly after being cut or crot, it seems to be more properly adapted for pasturage than for hay; although it will grow to a sufficient height for that purpose on a good soil. But, as the stalks grow so close upon one another, there is great danger of having it rotted at the root, if the season should have a tendency to dampness.—It produces abundance of seeds, which could be saved with less difficulty than either of the former.—Clay seems to be the soil that it most affects.

The leaves of this plant are broader than either of the former;—the flowers of a pale purple colour, springing from the bottom of the leaves by pairs;—the pods are first yellow, but black when ripe, and roundish almost like those of common pease.—These open very soon after they turn black, and shed the seeds,—which are freckled and flattened like the vetch,—or small yellow lupine, but not so bright in colour.

I have been attentive to these plants of the pea-tribe, chiefly because it has been often remarked, that no other class of plants afford such nourishing food for quadrupeds as this does;
from



Bush Vetch

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from which it is probable, that they would yield an hay of a more nourishing quality than any that is produced from culmiferous plants. And, as it is always for the profit of the farmer to have as great a variety as possible of useful vegetables that he can cultivate, that he may thus have it in his power to rear those only that are best adapted to his soil and other circumstances, it is imagined, the few hints that have been given relating to these may be of some use; especially as there are no other plants commonly cultivated by the farmer that are like these so strictly perennial, and which admit of being either cut or pastured for any number of years that he may incline:—Qualities that in some particular situations would render them highly valuable.

There are a great variety of plants of this class that I have had no opportunity of observing, that might probably be possessed of other qualities that might render them very beneficial to the farmer; and, therefore, they demand the particular attention of the improver. Among these, the common garden everlasting-pea, that is there cultivated as a flowering-plant, would probably yield a prodigious weight of hay upon an acre;—as it grows to the height of ten or twelve feet,—having very strong stalks that could support itself without rotting, till it attained a very great height.—But I have never
yet

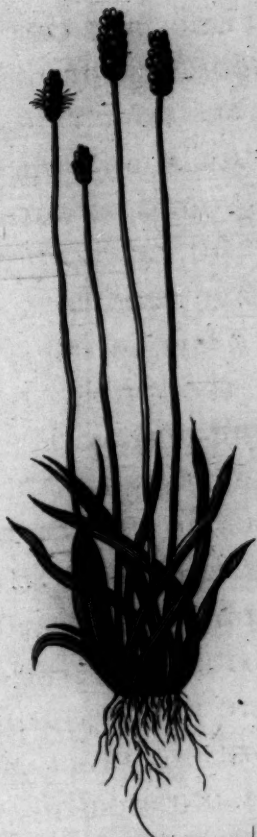
yet had an opportunity of trying it, or of knowing in what way it would admit of being cultivated.—To return to our pasture-grasses.

The narrow-leaved plantain, or rib-grass, is well liked by horses and cattle, and yields a very good crop upon rich ground tending to dampness, if it is, at the same time, soft and spongy; but, upon any soil that has a tendency to bind, or upon dry ground, it furnishes but a very scanty crop. But, as both this and white or Dutch clover have been long cultivated as pasture-grasses, it is less necessary for me to recommend them to the public notice. They are both good pasture-grasses.

The small grass leaved-plantain * deserves the attention of the farmer as a valuable pasture-grass. Like the milk-wort, it will thrive upon barren soils, where hardly any other plant could live. It may be most easily distinguished on poor clays, where it is frequently found, without the mixture of any other plant.—But it also abounds in many other pasture fields, where the grassy like appearance of its leaves prevents it from being remarked. I have seen some downs (links) upon the sea-shore, the soil of which consisted of a shelly sand, that were covered with this plant entirely.

Its leaves are small, and have much the appearance of some of the thickest and most succulent

* *Plantago tenuifolia*.



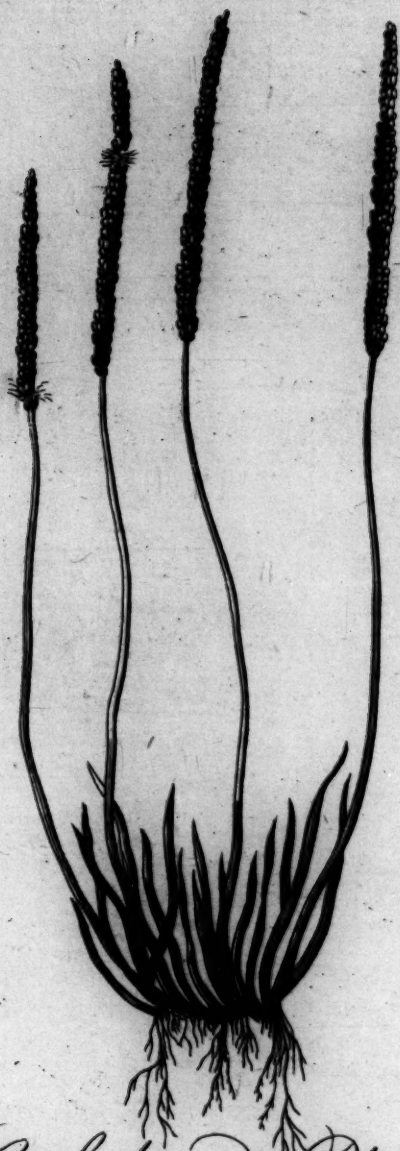
*Narrow leaved Plantain or
Ribgrass.*

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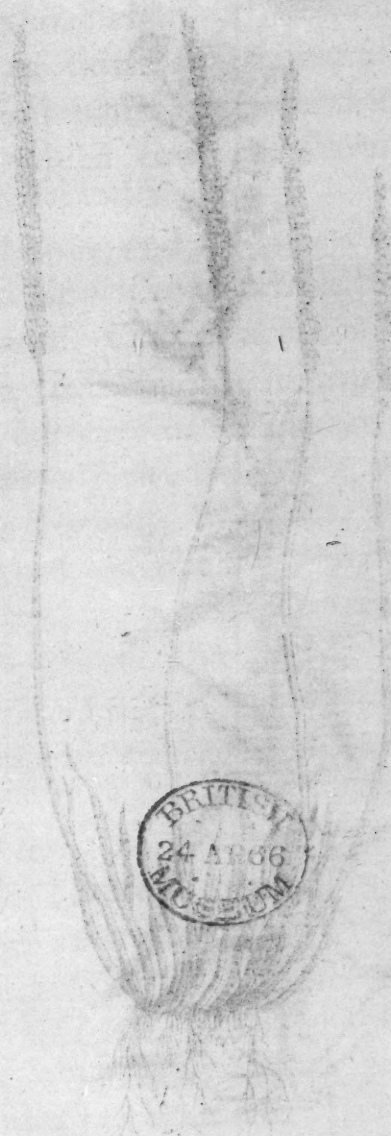


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Small Grass leaved Plantain

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Yarrow

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culent kinds of grafs.—Its flower-ftalks are numerous,—about eight or nine inches long, and the fpike of flowers and head ufually about three or four inches.—It produces abundance of feeds, which could be faved at little expenfe.

Cattle, horfes, and fheep, eat the leaves greedily, efpecially fheep, which bite it very close to the ground. On this account, the feed-ftalks are feldom feen but on the top of fail dikes, or on other corners, to which no kind of cattle have accefs.—Even the ftalks, while fucculent, are cropped readily by cattle: But, when they are hardened, and the feeds begin to ripen, they appear very coarfe and difagreeable to look at.

No plant bears the fea air better;—and it grows well where it is fometimes covered in falt-water.—It would therefore do well for falt-marfhes.

I fhall only mention one other that has come within the fphere of my obfervation, as deferving to be cultivated by the farmer; viz. the common yarrow *, *Achillea millefolium*, or hundred-leaved grafs, as it is fometimes called.

Thofe who may have formed an opinion of this plant from what they have remarked of it
by

* The farmers in Scotland will pleafe to take notice, that this is not the plant known among them by the name of Yarr, Spurrey, (*Spergula*,) but another plant of very different qualities; as they will obferve upon perufing the text.

by way sides, or other neglected corners where its flower-stalks have been allowed to advance, and its seeds to ripen, will probably be much surprised to hear *it* recommended as a valuable pasture-grass, as they may very naturally imagine, that no animal ever tastes it. For these flower-stalks are carefully avoided by every animal, while all the plants around them are eat to the ground.

But this plant is not singular in having its leaves relished by many animals, and searched for with avidity, while its flower-stalks are rejected by them with disgust. For nature, probably with a view to preserve the seeds of these plants from destruction, that were intended to clothe the fields with verdure, and furnish abundant food for all the classes of *graminivorous* * animals, hath rendered most of their seed-stalks disagreeable to the taste of the greatest part of them;—hence it happens, that the seed-stalks of almost all the grasses, properly so called, are disliked by almost every quadruped, while their leaves are relished as the most grateful food that they can find †; and, therefore, those kinds of
grasses

* Animals that feed upon plants.

† Ought not this to afford a presumption, that the hay that is made of the flower-stalks of *culmiferous* grasses will not be so palatable or nourishing as that which is made from the leaves, or other parts of such plants as admit of this?

grafs that run chiefly to seed-stalks are disliked as a pasture. It is probable, that the seed-stalks of every plant of this class are equally disagreeable, and would be equally avoided by them, were it not for the small size of some of these, and the number of leaves with which they are enveloped; which, at the same time, prevents the animal from selecting them from the other parts of its food, and from feeling the disagreeable flavour that they would be possessed of, if they were eat by themselves.

But, if the plant of which we now treat is allowed to remain untouched till its seed-stalks are formed, these become so large, and are so easily separated from all other plants, that every animal which feeds there can distinguish and avoid them with the greatest facility; so that, while the leaves that spring out at the root are eat down close to the ground, these are allowed to remain untouched till their seeds are perfected. And as, by their natural strength, they are able to resist the inclemencies of the weather, and remain standing long afterwards upon the same spot, when they assume a very disagreeable appearance, we have been induced, from these circumstances, to think but very meanly of the whole plant.

This prejudice is still farther augmented by another circumstance, that rather ought, in the strongest manner, to demonstrate the real value
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and excellence of this plant. For, as we never see one stalk of this grass in our finest pasture-fields, we too hastily imagine that *it*, in no case, contributes to the goodness of them. But the fact is directly the reverse of what it appears. For, upon a closer inspection, it will be found, that in almost every fine old pasture, a very great proportion of the growing vegetables with which it is covered, consists of this very despised plant;—but the animals who feed there are so fond of it, as never to allow one stalk of it in these situations to come to seed; so that it there always consists of leaves, which are confounded with the others of which the pile consists, and constantly eat along with them. This, therefore, forms one of the best grasses in our finest pastures, and is more universally found in these than, perhaps, any other plant whatever; which is probably occasioned by the extreme lightness of its chaffy seeds, which are easily carried by the wind to a great distance, and are thus more universally established than other grasses whose seeds are more weighty, and, therefore, less easily disseminated. As the seeds could be easily collected, and come up very readily when they are sowed, the farmer has it in his power thus to improve such pastures as he may incline at a very moderate expence.

One of the most perceptible distinctions that takes place between old rich pastures, and such
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as are newer, seems to be, that, in the former case, the pile of grass is much closer than in the latter; which, in all probability, arises from a difference in the nature of the plants that abound in the one or the other. For, if this were not the case, we might easily make our new pastures as close as any old ones could possibly be, by sowing a greater quantity of seed: But, should we attempt thus to make the pile of a new laid down rye-grass-field equally close with that of an old pasture, the plants would be so much stinted in their growth by this unusual degree of thickness, that we would lose our crop entirely. The only method, therefore, that remains to be followed by us, if we wish to make our artificial pastures to equal or exceed the finest natural ones in this respect, will be, to distinguish, with care, those plants that have a natural tendency to grow close upon one another, from those that require to have greater room to spread themselves; and to cultivate the former with care when we have once discovered them.—Thus, of the plants above enumerated, the sheeps-fescue, and creeping poa, or meadow-grass, naturally grow with their leaves much closer upon one another than rye-grass, or most of the others; and the purple-bush-vetch has always, perhaps, ten times more plants springing up in the same space of ground than the blue-tare above mentioned.—Now, it never

fails that the yarrow abounds very much in the very closest parts of the closest pastures; and, therefore, it would seem, on this account, highly to merit the attention of the farmer, as it will give him an opportunity of thickening his pasture-fields much more quickly than it would otherwise do.—But this plant seems to be altogether unfit for hay; and, therefore, ought only to be sowed where the field is intended for pasturage.

It seems to delight chiefly in dry soils; or rather in soils that are not wet:—For it arrives at its greatest perfection in rich fields that are naturally fitted to produce a rich and succulent crop of grass.—It grows also upon clays,—and is among the first plants that strike root in any barren clay that has been lately dug from any considerable depth; so that this plant and thistles are usually the first that appear on the banks of deep ditches formed in a clayey soil.

But, although it takes root upon clayey soils, and grows there more readily than most other plants, yet it delights more in a loose, spongy, porous soil,—a kind of soil on which fewer plants are found to prosper well than almost any other. The soil that is peculiarly fit for clover, is by no means so favourable for this plant as that on which rye-grass thrives in perfection.—But it will grow and thrive in a still more spongy soil than rye-grass can do. My experi-

experiments, however, have not yet been so numerous as to enable me to speak farther here with the certainty I could wish.

All animals delight to eat it; but, from the dry aromatic taste that it possesses, we would imagine that it would be peculiarly favourable to the constitution of sheep. They are very fond of it, and eat it to the ground in all their pastures.

Before I leave this article, justice requires me to acknowledge, that I owed the first thought of the usefulness of this grass to a hint with regard to it thrown out by Dr. Hill in some of his performances, which I found quoted in some book that I chanced to read.

There are no doubt many other plants that would greatly add to the value of our pastures, were their qualities and the mode of cultivating them duly pointed out. The *Melampyrum*, or cow-wheat, in particular, has been said to add greatly to the quality of the milk and flavour of the butter of the cows which feed upon it. But of this I have as yet had no experience.

I hope that this small opening will encourage others to proceed in the same walk, and oblige the world with greater and more important discoveries.

XXXVI.

What is the most œconomical manner of consuming the produce of any pasture-field?—That is to say—Whether ought the animals who are to feed upon it to be turned upon it at large, and be allowed there to remain without any change of pasture for the whole season; or ought they rather to be kept upon it only for a short time, and then carried to another;—or in what other way ought they to be treated, so as to turn out to the greatest profit of the possessor?



The practice that in general prevails throughout the greatest part of Britain in rich inclosed pastures, where domestic animals are intended to be fattened for the butcher is, to turn the whole number of beasts that it is supposed the field could properly maintain into it in the beginning of summer, where they are allowed to go at their own ease all the remaining part of the season, without any change of pasture at all.—And although many who have been accustomed to practise this method are very positive in their assertions, that it is the most œconomical mode of consuming their pastures that could be practised, yet, as I do not find that they

they support this assertion with any decisive experiments, there seems to be so many reasons to make us doubt if the fact is as they assert, as to make us, at least, suspend our opinion till the necessary experiments shall be fairly made, so as to ascertain this point with precision.

For, as the greatest part of the common grasses grow more quickly during the beginning of summer than they do after the season is farther advanced; if we were to attempt to put nearly as many beasts into the field as would be sufficient to eat up all the grass that advances at that period, they would not have half food during the remaining part of the season. To avoid this inconvenience, therefore, it becomes necessary to put only as many beasts at that time into the field as can be afterwards maintained in it properly, so that many plants must then be suffered to run to seed; after which no animal will taste them, unless constrained by hunger.—Many more are, at this period, trod down by the feet of the beasts in their wanton gambols, which are never afterwards much relished by them.—And, as it has been already demonstrated, p. 26. Vol. II. that many plants soon attain to a certain length, beyond which they never advance, if not eat down or cropped; the whole vegetation of the field must thus be stopped, and the total produce of it throughout the whole season be greatly diminished from
what

what it might perhaps have been by a more skilful management. And

If, with a view, to remedy, in some measure, this inconvenience, a greater number of beasts should be put into the field during the beginning of summer than towards the end of it, we would indeed, in some measure, diminish the evil, but not effect a radical cure.—For if the field were at that season eat so bare as to prevent any of the plants from running to seed, there would be some room to dread that the animals would be too much stinted for food to fatten kindly.—And as the grass upon which they have lately breathed is, in general, disagreeable to them, it is much to be doubted if they would come so quickly into flesh as would abundantly reward the hopes of the husbandman.

From these considerations, it would seem probable, that there must always be a considerable waste of food by this mode of management, let the farmer be as attentive as possible; which, it is imagined, might in a great measure be prevented by the following, or some similar practice.

As every kind of animal delights most to feed upon fresh plants that have newly sprung up from a bare surface, in which there is no decayed or rotted stalks of any kind; there can be little doubt but that, if cattle that are intended
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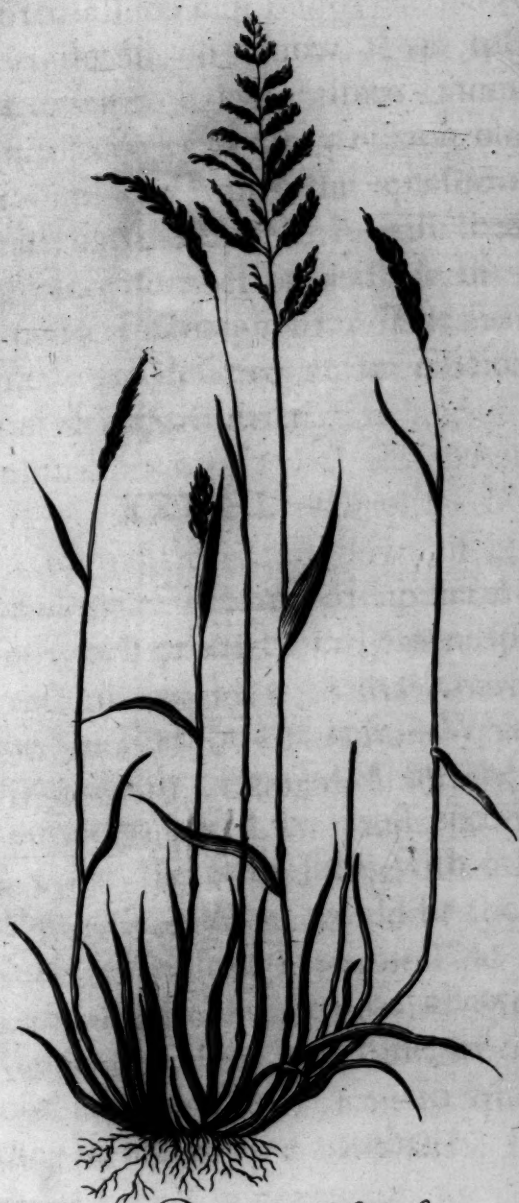
to be fatted were always supplied with a constant succession of this kind of food, they would be brought forward in flesh as quickly as the nature of that food could in any case do it.

To obtain this constant supply of fresh grass, let us suppose that a farmer who has any extent of pasture ground, should have it divided into fifteen or twenty divisions, nearly of equal value; and that, instead of allowing his beasts to roam indiscriminately through the whole at once, he collects the whole number of beasts that he intends to feed into one flock, and turns them all at once into one of these divisions; which, being quite fresh, and of a sufficient length for a full bite, would please their palate so much as to induce them to eat of it greedily, and fill their bellies before they thought of roaming about, and thus destroying it with their feet. And if the number of beasts were so great as to consume the best part of the grass of one of these inclosures in one day, they might be allowed to remain there no longer;—giving them a fresh park every morning, so as that the same delicious repast might be again repeated. And if there were just so many parks as there required days to make the grass of these fields advance to a proper length after being eat bare down, the first field would be ready to receive them by the time they had
gone

gone over all the others; so that they might be thus carried round in a constant rotation.

But, as it would be necessary to allow his fattening beasts always to have a full bite, it would not be proper to keep so many of these as would at any time eat any of these fields quite bare.—And as the grass that they would thus leave behind them would, in part, run to seed before they could return to the field, while some other parts of it would be withered, or half rotted, the pastures would be thus rendered less sweet and nourishing than they would otherwise have been.—And as there would likewise be a smaller quantity of grass produced on the field in this way than if it had been eat quite bare to the ground, it would be great want of œconomy in the farmer not to keep another set of young or lean beasts which should regularly succeed the first, and eat up all that they had left, so as to make it quite bare, and put it in a proper condition for vegetating again with vigour. And as it would be always in his power to augment or diminish this last stock, as circumstances might require, by keeping a few supernumeraries in some spare field, or by buying in others; it would seem that he would thus have a probability of reaping the full benefit of every blade of grass that could be reared upon the field;—more especially if the circumstances
menti-

P. 220.



Cocks tail or Feather Grass.

Vol. 2.



mentioned in the following disquisition were duly attended to.

There is no doubt, however, that cattle, when allowed to roam at large on an extensive field, will fatten very kindly if they have a sufficient quantity of food: But the question at present is, Whether the same field will feed to perfection a greater number of beasts in the one or the other mode of managing it? The subject is of importance, and deserves to be elucidated by *proper* decisive experiments.

XXXVII.

Can the produce of a farm be in general consumed with as much profit by only one species of domestic animals, as by a greater variety of these?—If the last shall be the case,—Which of the animals commonly propagated by the farmer in this country, could be most oeconomically reared upon the same farm with others?—And, in that case,—What would be the most proper method of feeding them?—That is to say,—Whether ought they to be allowed to pasture on the same field at one time, or to succeed one another upon it?—If so,—In what order ought they to follow one another?

As



As it is certain that one class of animals on many occasions delights to feed upon plants that are totally disregarded by, or even noxious to others, it would seem that, unless a man had his farm in such order as that no one plant would grow upon it that he did not cultivate, it might so happen that, among the variety of plants that spontaneously spring up upon it, there would be some that would be improper for any one class of animals;—all of which would be totally lost, if he should confine himself to that single species. But, as few farms are in the order here supposed, it seems highly probable, that it would be always an advantage for the farmer to keep more classes of animals than one upon his farm. And, considering it merely in this view, the greater variety he could keep, the less waste he would sustain. —But other oeconomical considerations may frequently make it proper for him to submit to this loss, instead of perhaps a greater that he might sustain by too closely adhering to it.

The rural oeconomist reaps another advantage by allowing different classes of animals to pasture the same field. For, even upon supposing that the whole of the plants produced upon it should be wholesome and agreeable to
one

one class; yet, as no animal will eat the grass that springs up where one of its own species has dunged, till it has got a winter's frost, although the grass produced by this means is greedily eat by another class of animals; if no more than one species is ever admitted into any field, the waste that is sustained by that means must be very considerable; which would have been totally saved by a more prudent management.

On another account, likewise, we would expect, that the farmer would derive some advantage by keeping different classes of animals rather than one species. For, as some of these naturally prefer the flowers and stalks of plants, which others reject and only eat the leaves; while other kinds are still more fond of the roots:—And, as some kinds bite much closer to the ground than others do, it would seem that, by having different classes upon the same field, much would be saved that must otherwise have been lost.

The Dutch, who are in all cases attentive to oeconomy, have long perceived the benefit that may be reaped from a due attention to this circumstance, and have turned it to their advantage; so that it has become a common observation among them, that, when eight cows have been in a pasture, and can no longer get any nourishment from it, two horses will usually subsist in it very well for some days; and, when
nothing

nothing is left for the horses, four sheep will live comfortably upon it for some time longer. In which case it is plain, that, if nothing but cows had been kept upon the pasture, all that was consumed by the horses and sheep would have been lost.

I imagine that all kinds of animals usually feed most quietly when they are not mixed with others; and, therefore, it is probable, that it would usually be most advisable to keep the different classes separate, as in the Dutch experiment. But, whether the order they prescribe is the best or not, I cannot pretend to say. As goats love the flowers and stalks, it is probable, that they should be first put into the field.—These might be followed by cattle, who love to get a full bite, and cannot eat close to the ground.—Horses, as delighting in shorter pasture, would probably succeed them with advantage; and sheep that delight in the crowns of roots, and that part of the grass that grows nearest the ground, ought, in all cases, to come last.

XXXVIII.

Are there not many useful animals known in different parts of the globe, that might be economically reared in this country, and tend much to promote the progress of many useful
I arts,

arts, if they were introduced?—If this is so,—What are the animals that promise to be of the greatest utility; and the particular purposes that each of them might be supposed most effectually to serve?



For the reasons alledged in the foregoing disquisition, it is plain, that the greater the variety of useful animals is among which the farmer may be at liberty to choose, the greater chance he will have to get every product of his farm consumed to the utmost advantage. For, as different classes of animals require food of different kinds, he will thus have a chance of getting every useless vegetable consumed with profit.

Hitherto, the attention of the farmer has almost never extended farther than to the five domestic animals so often mentioned in this Essay; horses, cattle, sheep, goats, and hogs; so that even some animals that are natives of this island, have been totally neglected, or considered in some measure as wild; and, therefore, beyond the sphere of the farmer's attention. Of this sort is the rabbit; which it is possible might on many occasions be kept as a tame animal with great profit; as it eats almost every green thing, and could probably be nourished

rished upon plants that are rejected by all our other domestic animals. And its fur, if the rabbit is of the best sort, is of such value as always to be sure of coming to a ready market.

But, not to dwell on what may by many be deemed such an unimportant object,—we may observe, that there seems to be no reason in the nature of things to make us suspect, that the goat of Angora, which furnishes the fine Mo-hair that constitutes such a considerable branch of our Levant-trade, might not thrive in Britain as well as in its native country. For, although we do get this wool from ports that are situated in a warm climate; yet the animal itself lives upon the rocky mountains of Pontus, where it experiences a very considerable degree of cold: And it might probably be bettered, rather than rendered worse, by being introduced into Britain.

The same arguments might be adduced to show, that the goat of Thibet, that carries the still finer fleece, known by the name of Touz, which is esteemed at three times the price of the famous Persian wool, might be here reared with profit; as the country that it inhabits is undoubtedly much colder in winter than any part of Britain.—Neither is there any certainty that the goat of Golconda, which yields the bezoar as well as a very fine wool, might not admit of being kept with profit in Britain; as it
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has never yet, that I have heard of, been fairly tried. But there can be no doubt but that the Chamois goat of the Alps would thrive well on the high mountains of Wales and Scotland, where hardly any other animal at present feeds: And the Bouquetin of the same country, which delights to live chiefly among the ice upon the tops of the highest Alps, and is in many respects an useful animal, would consume those plants that grow where none of our own animals at present dare venture.

The sheep of Persia and Spain are known to produce wool of a much finer quality than is found in any other part of the globe; which we have hitherto been disposed rather to attribute to the influence of their particular climate and pasture, than to any essential difference in the original breed of these animals reared in these countries; and, therefore, we have been disposed to look upon every attempt that may have been made to introduce these into our own country, as wild and chimerical; so as to sit down contented with our own situation, and allow the inhabitants of these countries to enjoy the benefits of their good fortune without molestation:—Yet the author hereof flatters himself with the hope, that, if the reader has attended to several observations that have occurred in different parts of this Essay, he will be disposed to think, that there appears not any
reason

reason against it so strong as to debar us from all hope of seeing such an attempt, if wisely conducted, attended with success.

The Lama, Guanacoe, and Paco of America, are varieties of a class of animals of the camel-tribe, which subsist upon little food, and probably delight to eat such plants as are either useless or noxious to all our domestic animals. Some of these have so much bodily strength as to be employed by the natives of Peru as beasts of burden, and they all afford a kind of wool of a peculiar quality that might be employed with success in many of our manufactures, and help to give them such peculiarities as might entitle them to a preference to those of other nations in foreign markets, were we so wise as to adopt them. And, although they be natives of a tropical region, it has been already showed, that there is reason to think they might be able to endure the cold of our climate without any apprehension of their being hurt by it; seeing they constantly chuse to frequent the snowy mountains that abound in their native country.

Neither are we as yet sufficiently acquainted with the nature and distinguishing qualities of the Urus, Bison, and Bufaloe; varieties of the cattle (Bos) tribe. In Italy, and other warm countries, the Bufaloe is employed as a beast of burden, and is supposed to be equal in strength to three or four horses. They yield a
confi-

considerable quantity of milk, of which good cheeses are made; and, altho' their flesh is not so much valued as our beef, yet the hide is deemed in many respects preferable to that of our ordinary cattle. In Hindostan, and other parts of the East Indies, they have another variety of these that are still more tractable than either the Bufaloe in Italy, or the ox in other parts of Europe, which are therefore employed as almost the only beast of burden in all these countries.—The Bison is reckoned still more docile and tractable than these, and is employed in some countries for the purposes of war; and, what is more surprising still, as a guard and attendant of their flocks in the same manner as our dogs. The Urus is a native of temperate climates, and although of an enormous size, is gentle, and easily tamed; but it is utterly unknown in Britain. In Louisiana, there is a variety of this class of animals that is covered with a very fine and close fur, that more resembles wool than hair, which is employed by the natives for the same uses as wool. These animals are there wild, but might easily be tamed. But, whether that fleece would admit of being annually shorn like that of sheep, or what would be its particular value in manufactures,—or whether the animal would be possessed of any other valuable qualities, we are as yet at a loss to know. Its flesh is esteemed by

those who have eat of it;—and its skin, dressed with the wool, forms such a warm and useful covering for the Indians and Canadians, that they have hitherto kept them entirely for their own use; none of them that I have heard of having been hitherto exported.

In North America, they have likewise a species of deer, called by the natives *Orignal* or *Aurignial*, which seems to be possessed of some qualities that might, perhaps, by the industry of man, be employed for his advantage. It considerably exceeds in height the tallest horse;—hath legs very long in proportion to its body;—runs with great swiftness; and, like all that class of animals, is endued with very great muscular strength; and may be easily tamed, so as to become as gentle as a lamb. This account I had from a gentleman who had frequently seen one of these in the possession of General Carleton, when Governor of Canada, that was tethered every day upon its pasture like a cow, and was equally tame.—This is probably the same animal that has been denominated by the English moose-deer, of the existence of which so many have doubted.—In its wild state, it lives in winter chiefly upon moss and branches of trees, in this respect resembling the Rhen-deer of Lapland. But, whether it could be brought at that time to feed upon any of the kinds of moss that so often cover our pastures,
—or

—or whether the Rhen-deer is really incapable of being kept in any climate more temperate than Lapland, which has been often asserted with a great degree of confidence *;—or whether any other variety of this class of animals, or any other creature that could be useful to man, could be fed on any of these sorts of moss that so much abound in all our old pastures, and are entirely useless for every æconomical purpose that we know of, is not at all ascertained; although it is a subject highly deserving the attention of the public.

O 2

Many

* However positively this may have been frequently asserted, there seems to be much room to doubt if the fact be really so, as there is found in all the provinces of North America, even as far south as the back settlements of Virginia, an animal of the deer-kind, called by the natives *Caribou*, which is acknowledged to be in all respects the same with the Lapland Rhen-deer. And what reason have we to imagine, that an animal which can bear the intense summer-heats of Lapland, would not live in a more temperate climate, where those kinds of moss on which it chiefly delights to feed can be found?

Of all the animals that roam through the woods of North America, none are more wild than the *Caribou*, nor have the natives ever once thought that it would be possible to tame it, or render it serviceable to man as a domestic animal; although the experience of the poor Laplanders sufficiently shows that it may be rendered tame and gentle, and furnish alone almost all the necessaries of life to a frugal and abstemious people. From which example we ought to be taught never to despair of being able to domesticate almost any graminivorous animal, however wild, if it can be of any essential service to ourselves.

Many other animals have been slightly mentioned by historians as possessing particular valuable qualities, but with so little accuracy as not to admit of our relying on their accounts as certain. Of this class is the *Anta* of Peru, an animal of the bufaloe-tribe, but of an uncommon kind, particularly esteemed there for the remarkable strength and thickness of its skin. The *Taparissou*, an animal of Brazil, said in some respects to resemble an ox and an ass,—remarkable likewise for the extraordinary strength of its skin.—Others assert, that in Brazil they rear a kind of animal resembling a sheep, as large as a horse, with long horns and a short tail, &c. &c.—But whether such animals as these do really exist or not, is very uncertain; and, if they do, it is as doubtful if they could be of any use to us. But surely such objects deserve the attention of philosophical enquirers. The existence of the animal called *Nil-Ghau*, so lately seen in Britain, and so well described by Dr. Hunter, was deemed, at least, as great an uncertainty as any of these.

XXXIX.

We in Great Britain are as yet so little acquainted with the nature of the mule, and, at the same time, have so many imperfect accounts of the amazing strength and hardiness of that singular

singular animal, as makes it much to be desired that an authentic account of it could be procured for the benefit of the farmer, that so he might know how far it might be prudent in him to make use of this in preference to every other beast of burden.



This animal is said to be possessed of much greater strength, in proportion to its size, than either the horse or the ass;—is longer lived than either of them, and can be supported on much poorer fare;—is hurt by no sort of bad treatment;—patient under hardships, with a long etc. of qualities, that those who are unacquainted with it have difficulty to bring themselves to admit of, and yet know not how to reject, the evidence with which they are supported being sometimes so very strong.

One would imagine, that, if all these extraordinary advantages result from this kind of unnatural crossing the breeds of animals, that those who have experienced it in this instance would have endeavoured to try what would have been the result of a similar crossing with regard to other animals that nearly resemble one another;—such as the cow with the urus, bison, or bufaloe—the deer with the cow or goat, &c. &c.—But I have met with no account

count of any uncommon species of animal of the mule kind, excepting one that carries in its face so much the appearance of a fable, that I shall give the account of it in the very words of the author who relates it, Jean St. Leger, in his account of Switzerland:—‘ Among * the
 ‘ domestic animals, says he, there is only the
 ‘ *Jumarre*, that is altogether unknown in the
 ‘ northern countries. This animal is procreated
 ‘ either between a bull and a mare, or between
 ‘ a bull and a she afs. The first are the largest,
 ‘ and are called *baf*;—the latter are smaller,
 ‘ and are called *bif*.—

— — — — —
 ‘ ——— They have the head and the tail of an
 ‘ ox, with a small excrescence in place of the
 ‘ horns; the rest of the body resembles that of
 ‘ the horse or afs. Their strength is inconceiv-
 ‘ able with regard to their size. They are smaller
 ‘ than mules,—eat little, and are surprisingly
 ‘ expeditious on a journey (*devorent le chemin*.)
 ‘ I have travelled eighteen leagues, altogether
 ‘ on mountainous roads, on the 30th of Sep-
 ‘ tember on a jumarre, but with a good deal
 ‘ more ease than I could have done it on horse-
 ‘ back.’

To

* *Entre les domestiques, il n’y a que les jumarres, &c. Hist. Gener. des Eglises Vaudoises, par Jean St. Leger, pasteur. F. p. 8.*

To deny a fact so positively asserted by a man of character, unless we had direct proofs of the contrary, would be rather bold.—At the same time, I must acknowledge, that the difference of the mode of copulating is so great between cattle and horses, or asses, that it is hardly possible to avoid reading this account with some degree of scepticism. Mention is made of this same jumarre, which is called *gimarro* in Italy by other authors. But, as many of our nobility and gentry have occasion to pass through Switzerland in their way to Italy, it would be easy for them, if they chose it, to get satisfaction as to this fact upon the spot.—

XL *.

Some plants grow only on a hard firm soil, and others thrive only in an open spongy mold.—Required—A list of each of these two opposite classes of plants, as also a specification of such plants as *approach* to either of these extremes?



It has been often disputed by practical farmers, whether rolling ground was an advantageous

This article, and the two following, ought to have been inserted after VIII. p. 39. but they were accidentally omitted in that place.

tageous practice, or the reverse.—Probably this may, in some cases, depend on the nature of the soil,—and in others it may be influenced by the peculiar œconomy of the plants that grow upon it.

The broad-leaved plantain * requires a soil of such an unusual degree of compactness, as seems hardly to be ever met with naturally;—on which account this plant is almost never seen but upon road-sides, or other places where the ground has been artificially compressed by some weighty body passing frequently along its surface †; hence it has obtained the vulgar name of the *way-faring* (corruptly *wavering*) leaf. If this were an useful plant, it could not be propagated without the help of frequent rolling.

The common knot-grass ‡ possesses the same quality in some measure, although not in such an eminent degree as the former, as it is most frequently found on places that have been much trod upon, and afterwards allowed to be undisturbed for some time; but it is also sometimes met with in other places.

The

* *Plantago major*.

† I have been assured by a respectable person, that this plant is often met with in the common fields in some parts of the county of Durham. If so, the soil must be very uncommon, and deserves to be accurately described. I never found it in the common fields in any place where I have been.

‡ *Polygonum aviculare*.

The same may be said of the annual meadow-grass*, which is the last plant that disappears on road-sides, except the two above named; but it is also found in situations where the ground is not near so much compressed.

Many other plants that grow naturally upon such soils as have an unusual degree of firm compactness, can only be made to grow on more spongy fields by frequent rolling, or pressure of some sort, which gives them artificially that firmness of texture they had not naturally.

Perennial red clover † is a plant of this sort. It prospers abundantly in firm, and what might almost be called obdurate soils;—but, in others of a looser texture, it is to be found only in the foot-paths that may accidentally be made through the fields. I have seen a foot-path of this sort stored with this plant for many thousand yards in length, while not a single stalk of it could be found in the fields on either side.

The common white, or Dutch clover ‡, delights also in a firm soil, although it does not require such a degree of compactness as the former; and, therefore, prospers in many fields without any artificial pressure; but, on very spongy soils, art must supply the deficiency of nature, or it will not thrive.—Hence it happens,
that,

* *Poa annua.*

† *Trifolium pratense.*

‡ *Trifolium repens.*

that, on soils of this sort, white clover is frequently seen to flourish exceedingly on such foot-paths as are moderately trod upon, while it only languishes, or hardly appears in other parts of the field.

On the contrary, the small-leaved sorrel * requires a soil of an exceeding open and spongy texture, upon which alone it can be made to grow,—and is totally destroyed by any kind of weighty continued pressure upon it; of which I had once an opportunity of being fully satisfied, by an experiment that deserves to be recorded.

I had occasion to lay down a small spot of ground of this open spongy sort into grass by way of *lawn*. It was sowed with white clover seeds;—but, in some of the spongiest, or, as the practical farmer would call it, *deafest* places, this small-leaved sorrel came up in such abundance, as to choak the clover, so that hardly a single plant of it could be seen.

Vexed at this disappointment, I was extremely anxious to get this useless and unsightly plant eradicated:—But, being at that time little acquainted with the nature of it myself, having come from a part of the country where it was hardly known,—I enquired at those who had been accustomed with it from their infancy how it might best be destroyed—but in vain.

A very

* *Rumex Acetosella*.

A very little attention, however, made me soon observe, that this plant was never found but on soils that were exceeding spongy and open; and, therefore, it seemed probable, that, if these soils were rendered firm by pressure, it might be thus destroyed.

And as rolling seemed to be the easiest method of effecting this, I resolved to try if it could be killed by this means.

With this view, a weighty stone roller was brought to that part of the green where the sorrel abounded most, which was drawn along it for twenty or thirty yards, and pushed back again to its former place regularly every morning,—keeping always exactly in the same tract.

In a few weeks the sorrel totally disappeared; and the little alley, formed by the roller in its course, became covered with a close pile of white clover; although the ground on each side of it still abounded with the sorrel, and hardly a stalk of clover appeared among it.

Old pasture-fields, in our northern climate, are frequently over-run with fog, consisting of various kinds of mosses, which prosper abundantly during the winter-season. I never yet observed any fog in the foot-paths thro' the fields that were most infested with it. This would seem to indicate, that frequent pressure might be an effectual means of eradicating it. Every circumstance that I have yet observed relating

lating to the growth of this species of plants, seems to indicate that they prosper best on a spungy open soil.

Spurrey*, or, as it is sometimes called, *Yarr*, —is only found in the same sort of spungy soils. —It is an annual plant, that is exceedingly pernicious to the crops of corn in those countries where this kind of ground abounds. In firmer soils, the charlock†, and wild mustard‡, become the scourge of slovenly farmers in its stead.

When this spungy deaf soil is in a different state of cultivation, it naturally produces the common dead (vulgo dea) nettle. This especially abounds where a soil of this sort is trenched up, and the mold that has been long buried deep is exposed to the air.

The cocks tail, or feather grass§, also requires an open and spungy mold, and cannot be made to thrive in any other.—Hence it happens that, in countries where this soil abounds, all the *manured* fields become naturally covered with this kind of grass when they are left to themselves: For, as the seeds are light, they are carried by the wind to a great distance, so that there is never want of seeds in abundance to stock all the fields.—And, where this grass prospers, it roots out all other sorts.

Rye-

* *Spergula*.

† *Raphanus raphanistrum*.

‡ *Sinapis arvensis*.

§ *Stipa pennata*.

Rye-grafs * will indeed make a struggle with it. And, when the ground is properly cleaned, —and a little consolidated by a good mode of culture,—if rye-grafs seeds are then sowed in abundance, it will usually get the better of the former.

This species of grafs, which is now so universally cultivated in most parts of Britain, requires a deep, open, loose, deafish soil, tending to dampness, to bring it to full perfection. Wherever the cocks tail grafs naturally abounds, skilful culture will make the rye-grafs flourish exceedingly. Nor do those who have not seen a soil of the nature here treated of, know to what an amazing degree of luxuriance this plant may be reared. I know well that people who live in countries that enjoy a much better soil in general than that which has been familiar to me for some time past, would be little disposed to give me credit, should I assure them, that, on a soil of this sort, I have measured several stalks of rye-grafs above six feet in length.— Yet this is a truth that could be attested by several respectable persons who saw, and measured these stalks, should it be thought worth enquiring into †.

I for-

* *Lolium perenne*.

† It is necessary to remark, that no kind of culture could bring rye-grafs to this amazing length, unless the season
was

I forbear to mention the weight of hay I have cut from an acre of this sort of ground at one cutting, as I am sensible it would appear incredible.

Yet, on this soil, no culture that I have yet seen tried can produce an abundant crop of red clover; which requires a weightier, firmer, or sharper soil.

The cocks tail grass, as has been said, only appears in fields that have been *manured*.—In other fields, consisting of the same kind of soil, the small bent grass * as naturally and universally establishes itself.

The subject treated of in this disquisition has been so little attended to, and so few practical farmers have had an opportunity of being intimately acquainted with soils differing so much from one another, as those that have furnished matter for these observations, that I am afraid I shall hardly here be perfectly understood. It is, however, extremely important, and deserves to be farther elucidated.

Allow me here to draw one useful corollary, that naturally arises from the consideration of this subject, which I would beg to recommend to the attention of young and sanguine improvers

was remarkably dry;—for, when the soil is rich, and the season damp, such a luxuriant crop would be rotted long before it could have attained any thing like maturity.

* *Agrostis capillaris*.

ers in agriculture, as it might tend to inspire a little of that rational diffidence, the want of which has proved the ruin of thousands who have set out in that career.

If large and extensive districts are to be found,—in which the soil, through almost every part of the one, differs very much from that in the other, as to the above mentioned particulars, although they may perhaps agree very much in their general appearance, and the proportion of sand and clay, and the other distinguishing particulars of soils usually taken notice of by writers on agriculture, or others, it must follow, that the man who is well acquainted with the best mode of culture for the one of these countries may be altogether unacquainted with the best method of treating a field that he might think was very much of the same nature with his own, in another district.

Hence it follows, that the travelling farmer ought to be cautious how he condemns some particular practices he may observe, that may to him appear extremely unreasonable, as circumstances may sometimes render one practice very proper,—which, upon a soil of another sort, would be attended with the most baneful consequences.

Hence, likewise, it follows, that the young improver ought to be extremely cautious how he adopts the advice of such farmers as may
I have

have been bred on a district, at a great distance from his own, as he may ruin himself in pursuing a practice in the one case, that might be highly advantageous in the other. The hints of sensible men in his neighbourhood ought to be listened to with attention; but an observing eye, and an unremitting attention to such facts as may occur to one's self, are the only sure guides. Till experience has accumulated wisdom, safety consists in cautious circumspection alone.

If I speak here with a more than ordinary degree of sollicitude, it arises entirely from a full conviction of the mischievous consequences that often result from an opposite conduct, and a warm desire to avert from others such calamities as I have in many instances seen arise from it. My own extensive experience in two very distant and dissimilar parts of the country*, enables me to speak with the greater certainty on this head.

As few who have always remained in one corner of the country can have had an opportunity of perceiving the influence of particulars of this sort in their full force, I shall beg leave to mention an anecdote relating to it that occurred to myself.

Some

* The writer was born near Edinburgh, in Mid-Lothian, and practised agriculture there for several years before he returned to Aberdeenshire.

Some years after I had been in Aberdeenshire, two very sensible farmers from the Lothians came to visit me in one season, separately.—It happened that I was fallowing a field that year of a soil of an exceeding bad quality, which, in its external appearance, greatly resembled some of the best fields that these gentlemen had been accustomed to see; and both of them, separately, after walking over my farm, and examining the different fields with attention, pitched upon this as the very best field in my farm,—although it was in fact by far the worst they had seen.

One of these gentlemen had practised farming in his native place, with the greatest success, for upwards of fifty years;—and the other, for more than forty.---They were both men much esteemed for their knowledge and discretion; nor was there one in the country where they lived that could have formed a juster judgment of the value of any soil there than they could have done.

A decision nearly similar to this was given afterwards by a very ingenious and successful farmer in Northumberland. The truth is, neither of them had ever seen a soil of the nature of that in question; and it was no impeachment on their judgment, if they were unacquainted with its real qualities, and therefore reasoned from analogy, that it would approach

nearer to the nature of those soils that it most nearly resembled.

XLI.

Some plants can be reared only upon soils that have been manured with one kind of manure, and the growth of others is chiefly promoted by other manures.—Wanted—A list of such plants as have their growth chiefly promoted by any one sort of manure, in preference to another.



Experience shows, that the common pea, whether white or grey, cannot be reared to perfection in any field which has not been either naturally or artificially impregnated with some *calcareous* * matter.—Hence it happens, that pease are rarely cultivated universally as a field crop, unless in those parts of the country where either lime, or marle, or chalk abound. But, on the sea-coast, where shell-fish are often caught in abundance, we meet with a few exceptions to this general rule.

It

* Calcareous is a general term, including all those substances that might be converted into lime, if unmixed with any other extraneous matter.

It is pretty remarkable, that a soil which could hardly have made one pea come to perfection, although richly manured with dung*,---if it shall have been once limed, shall be capable of producing abundant crops of pease ever afterwards, if duly prepared in other respects.

Turnip, on the other hand, will grow in any soil, if it is manured with dung;---but lime does not promote its growth in such a high degree.—Hence turnips are the first improving crop in a country destitute of lime,—and pease in the other.

In countries where coal-foot is used as a manure in large quantities, the opinion prevails that this manure destroys clover, while it greatly encourages the growth of rye-grass. But I have had an opportunity of remarking, that this opinion is erroneous; although it is easy to account for the way in which it has come to be so universally adopted.

For foot, although it does not destroy clover, does not in any sensible degree promote the growth of that plant, when applied to the ground in any proportions. I have used foot as a top dressing for clover and rye-grass in all proportions, from one hundred bushels per acre, to six hundred †;—and I cannot say that ever I

P 2

could

* In these cases the pea seems to haulm, and usually dies away after blossoming, without ripening the grain.

† The bushel is not a common measure in Scotland: It is nearly the same with the pease, or meal firlot.

could perceive the clover upon these fields in the least degree more luxuriant than in the places where no foot had been applied.

But the effects of this manure upon the growth of rye-grass is amazing,—and encreases in proportion to the quantity, as far as my trials have gone.—Hence it happens, that, in fields dressed with foot, the rye-grass so far overtops the clover, that it is not seen,—and the whole crop *seems* to be rye-grass,—although, in fact, there is as much clover as if it had not been manured at all.

This is a very satisfactory proof of the influence of one manure in promoting the growth of a particular plant in preference to that of another. There are no doubt many others that the farmer is at present ignorant of.—I shall suggest a few.

It constantly happened, that, where a heap of foot has lain so long upon the ground as to destroy all the plants upon its surface, the first plant that appears afterwards is the common couch-grass*.

It as universally happens, that the first plant that appears where a heap of common stable-dung has lain, is the common knot-grass†.

Sain-foin thrives upon the thinnest lime-stone—gravely, or chalky soils, with great luxuriance,

* *Triticum repens.*

† *Polygonum aviculare.*

ance, even where these are so poor as to afford a very scanty crop of other sorts of grafs.

On much richer soils, that are not so highly impregnated with calcareous matter, that plant only languishes---on many occasions it dies entirely.---Hence sain-foin is a most valuable crop in chalky countries,--in others it is justly thought of no value.

Lime seems to promote the growth of rye-grafs in a higher degree than it does the growth of feather-grafs.---For, in fields that naturally abound with this last, and in which it even gets the better of rye-grafs when it is sowed,--if the ground be limed, the rye-grafs flourishes and destroys the other;---and, when that fails, it is succeeded by white clover and the poa-grasses, rather than by the feather-grafs.

XLII.

There is reason to suspect that certain manures which operate most powerfully upon some soils, do not promote the fertility of other soils in the smallest degree.---It would surely be of great use to the practical farmer to be made acquainted with these peculiarities.

In



In the part of the country where I was born, and first practised agriculture, no manure whatever produced such a powerful and lasting effect as horn shavings.---Compared with the best yard (midding) dung, in the proportion of one stone of shavings to a cart-load * of dung, the effect of the first was, at the beginning, about equal, but, after the first crop, it was greatly superior.

In the place where I now reside, I have found the effect extremely different.---A field of a good loamy soil, little different in appearance from those on which I had formerly laid this manure with success, was fallowed, and got a thorough dressing of horn shavings.---It has since that time carried seven crops of corn and grass; but I have been able to perceive no sensible effect of the manure on any of these crops. There has hardly been even a single tuft of grain more bushy and strong in one part of the field than another;---a circumstance that could

* Nothing is so indefinite as a cart or waggon-load of things of this sort, that are not commonly weighed or measured; therefore, it were to be wished that writers on agriculture would endeavour to define them accurately.—The cart-load here meant may be a quantity between thirty and thirty-six bushels.

could hardly be avoided in using this manure, from the impossibility of spreading it so equally as is necessary.

Common salt is another manure that I have tried almost with the same success. It is well known, from numberless well authenticated experiments, that the most ordinary effect of this manure is, to promote the fertility of the soil in a very sensible degree, for a short time, when used in moderate quantities, and to check the vegetation of every kind of plant for a certain period, if employed in an over proportion.

To try the effect of it upon my own particular soil, I fixed a pin in the middle of a plot of grass in the month of May,—and round that, as a centre, described a circle of two yards diameter.—Around the inner circumference of that circular line, I strewed some common salt very thin, making it gradually thicker and thicker as it came towards the centre, till, at the pin itself, the salt lay near an inch thick upon the grass.

The whole was soon dissolved by the dews and rains, which were not copious at that season. I looked with impatience to observe the effect of the experiment,—but with astonishment observed, that the spot could not have been distinguished from the rest of the green, except by the pin, which was allowed to remain in its place three years.

I leave

I leave philosophers to account for these uncommon phaenomena.—Let the farmer, in the mean time, be taught from them, to proceed with cautious diffidence in the application of new and untried manures. For, it is not enough that he should be *certain* that they have been attended with the most beneficial effects, when tried by another—before he can be assured of success, he himself ought to try their effects by a *fair* experiment on a small scale, and be determined in his practice *at large*, by the result of that experiment, if it has been clear and decisive.

One other practical inference may be drawn from the above mentioned facts, which might be of service, if duly attended to.

Nothing is more common than to see writers on agriculture, who have lived in different parts of the country, accusing one another of falsehood and misrepresentation; because, perhaps, the one has recorded an experiment, with its result,—which has been tried by the other, with all imaginable fairness, who has found the result to be extremely different.—He repeats the experiment with all the necessary precautions, ---but still the result is the same;---from whence he infers, that the first has told a falsehood to support some favourite theory.

Perhaps I myself might have been accused of this in the present case,—had not my own experience

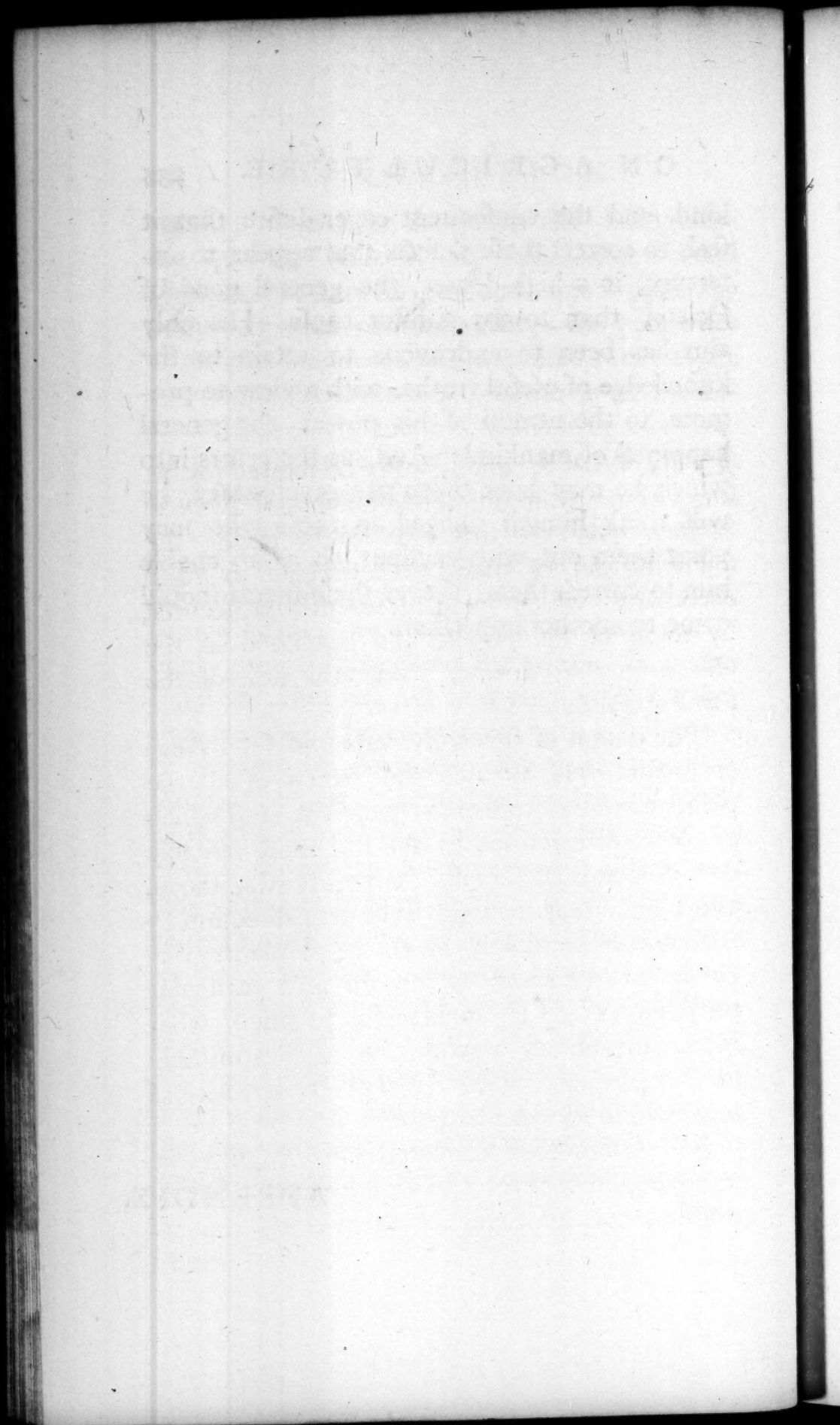
perience furnished both the results differing so much from one another.—But, if soils differ so much from one another, in some of their most essential qualities, while they are not sensibly different in their external appearance,—ought we not to conclude, that the circumstances that may affect the farmer, are often so much concealed, as to authorise no one to dictate positively for another in all cases.—Let us then proceed with ardour in our researches, but with unceasing caution and diffidence, whenever we exceed the limits of our own proper experience.—A man who, with confidence, prescribes to others what should be done *in all cases*, is most certainly unacquainted with the art he professes, and must often fail.—Nor would this be so much to be regretted, did not those who are so sanguine in the opinion of their knowledge, usually advise others to proceed upon such a large scale as must be attended with certain ruin to the undertakers, if it does not fully succeed.



Thus it appears, that, in whatever light we view this subject, we meet with much uncertainty and doubt. Were we to proceed forward,

ward, and consider the nature and distinguishing qualities of different soils;—the several changes that may be produced upon these by culture or other circumstances;—the properties of different manures, and the effects that these, in various circumstances, produce upon the different soils;—the mode of cultivating each variety of plants, so as to bring it to its greatest perfection;—the effects of these upon the soil, and the consequences of all the different alterations of crops, with all the variety of collateral circumstances that branch out from these capital heads; we would find the same uncertainty prevail throughout the whole, as in that small part that has just now engaged our attention, and might probably meet with a still greater variety of dogmatic assertions and ill-founded opinions, maintained with a still greater degree of obstinacy, than the few that we have had occasion to reprehend. But it was judged proper here to desist. If, in the foregoing pages, it should be imagined that the writer hath, on some occasions, assumed a more decisive tone than may seem to be consistent with a work of this nature, he hopes the candid reader will be more disposed to ascribe it to that involuntary ardour that naturally arises in the mind when it contemplates objects that it deems of great importance to numbers of mankind,

kind, and the consequent eager desire that it feels to correct those defects that appear to interrupt, in a high degree, the general good of society, than to any sinister cause.—His only aim has been to endeavour to attain to the knowledge of useful truths, with a view to promote, to the utmost of his power, the general happiness of mankind: And, as the errors into which he may have fallen are involuntary, he will think himself obliged to those who may point them out with candour, so as to enable him to correct them, if ever these sheets should come to another impression.



A P P E N D I X.

LINNÆUS, who is justly celebrated for his knowledge in the different branches of *Natural History*, gave the first hint for beginning the following set of useful experiments in rural oeconomy, which were afterwards prosecuted by some of his pupils, and published in the *Amoenitates Academicæ*, under the title of the *Swedish Pan.*

The design of this truly valuable set of experiments was, to ascertain which of all the plants common in Sweden were eat, and which of them were refused by the five most valuable domestic animals, oxen, cattle, horses, sheep, and swine, that it might serve as a direction to the rural improver in the choice of plants proper to be cultivated by him for any particular purpose, as also to enable him to know what species of animals it would be most profitable for him to allow to be fed with the produce of any field in its natural state.

Mr. Stillingfleet translated into English the introduction to this set of experiments,—but he omitted the experiments themselves,—on ac-

count of the difficulty of making ordinary readers know the plants by the names that were given them.

I am not satisfied that this reason is sufficient to prevent a translation of this set of experiments from being of some use, even to the English reader; as few persons are unacquainted with many of the plants by their English names; and as there are fewer still, who have the smallest spirit of enterprise, who may not have an opportunity of getting the particulars about which they may be at a loss explained by some of their acquaintances, if they are really desirous of it.

On this account, I have chosen to publish the experiments themselves,—having subjoined the English names given to the several plants, taken from Hudson's *Flora Anglica*; to some of which I have added such vulgar names as have come to my own knowledge.

I have likewise been tempted to undertake this, in some measure with a view to excite a desire of attaining an adequate knowledge of botany among philosophic farmers, who would reap many benefits from a competent proficiency in this science.

The utility of this branch of science will appear plainly from the perusal of the following set of experiments. For, without its aid, it would have been impossible for any inhabitant
of

of Britain to have been benefited by any of the facts contained in them ; as it would not have been possible for them to have known, with certainty, any one plant mentioned through the whole of these numerous experiments ; whereas, it is now easy to know, with the utmost certainty, every herb that occurs.

Those who view botany in this light,—who consider it as a necessary step of that ladder by which they may be enabled to attain useful knowledge, will look down with equal contempt on those who rest satisfied with being able to name every plant that may occur to them, and consider this as the ultimate use and end of this science ; as of those who, with a fastidious pride of mind, despise this pursuit as mean and ignoble, and glory in their ignorance of a science they think unworthy of the attention of men who are busied in pursuits of things of real utility.

It is indeed no more at best than a vocabulary ; and, although it be possible for one to learn all the words of a vocabulary, without attaining any knowledge of the language ; yet it is impossible for a stranger to that language to attain a knowledge of it, without first retaining in his memory the words of which it consists ; which he will best attain by the aid of that vocabulary.

The

The science the botanist ought to wish to attain, is the *knowledge of plants*.—The several systems of botany that have been invented, pretend to do no more than to class these plants in such a manner as to facilitate the attainment of their names:—It is therefore of the greatest importance, as a *mean of attaining knowledge*; but, as an *ultimate end*, it is perhaps, the most trifling pursuit that can occupy the mind of man.

A man who values himself for his knowledge in this mere system of classification, without aiming to make it of any other use, exactly resembles him who should glory in being able to repeat with facility all the words of any unknown language.—If the mere botanist adds any thing new, he may be of some use to others, by abridging their labour,—but must be considered as the veriest dunce of a drudge that ever existed. His life is spent in the arduous pursuit of a shadow, instead of a reality.

Linnaeus,—although he has done more to assist others in attaining the names of plants with certainty and facility, than perhaps any other man,—seems to view the science in its proper light; as he has endeavoured to extend the views of his pupils to the desire of discovering such plants as are endowed with qualities that may be of use to mankind. The following set of experiments is one satisfactory proof

proof of this; and many others might be produced, were this a proper place for it.

We have reason to regret, that other eminent naturalists, who live in other parts of the world, have so seldom followed his example in this respect.—And it ought to cover them with shame, when they reflect that, under the influence of this single man, the small and inconsiderable kingdom of Sweden should have produced a greater number of really valuable experiments on the uses of plants, and other natural bodies, within these few years, than perhaps all Europe besides; although the attainment of knowledge there is much more difficult than in many other places; and although it is next to impossible for the most successful experimenter to publish his discoveries to the world, without almost a certainty of losing by the publication.

The following experiments were published by Nicolas Hasselgren in the year 1749,—who, after having mentioned the first hint for this purpose that was given by Linnaeus, in the relation of his journey to Dalicarlia, *ann.* 1734, and taking notice that his disciple Professor Kalm, in imitation of him, mentioned some of the plants that cattle eat or refused, which he had occasion to remark in a journey he made to Bahus,—he adds,

“ Anno 1747 and 1748, our president (Linnaeus) undertook, with great diligence, not only to make experiments himself, but to excite his disciples and auditors to do the same; of which I was one. Thus, at last, many experiments were made, and repeated, especially by D. D. Hagstrom, Mag. E. G. Liidbeck, E. Ekelund, J. G. Wahlbom, L. Montin, F. Oldbers, J. C. Forskahl, A. Fornander; not to mention others who strove, as it were, to outdo one another in finding the plants, which were most suitable for different animals.”

When shall Britain be able to produce such a fraternity, emulously contending who shall most promote such another set of useful experiments?

By this means, they were enabled to produce above two thousand certain experiments, some of which were repeated, he assures us, ten times over, and some of them twice as often.

The plants were chosen when the leaves were in perfection, and were handled as little as possible before they were given to the different animals. They were offered to these animals when their bellies were pretty full; and every possible caution was taken to obtain a perfect knowledge of what they voluntarily eat, and what they rejected.

It

It is not, however, to be doubted that, should the same experiments be repeated by others, the result might differ in many instances.—Some individual animals are much nicer in their taste than others *naturally*;—others, from *habit*, may be induced to eat with pleasure many plants that they would have at first refused. From which circumstances, the result of the same experiment, tried at different times, on different animals, might vary.

Nevertheless, it may, in general, be allowed as an undoubted fact, that whatever plant has, in any of these experiments, been eat by any class of animals, will, in general, be eat by other animals of the same class, if proper means are used for inducing those that are shy at first to taste it, and become acquainted with it.

But it is by no means certain, that, although all the animals of one class have refused a particular plant, other animals of the same sort will on no occasion be induced to eat of it. I shall have occasion to take notice of several instances of this sort that have come to my own knowledge, which shall be subjoined by way of notes to the table of experiments.

In the table that follows, the Latin generic name of the plant is first given in Roman characters, after which follows the name of the species in Italics—which is succeeded by the

English name, taken from Hudson's *Flora Anglica*.

The following letters indicate the duration of the different plants:—A, signifies an annual plant; B, a biennial; P, a perennial; T, signifies a tree or shrub; and the numbers I. II. III. &c. show the times of their flowering, viz. January, February, March, &c.

The five columns on the right hand serve to denote the five domestic animals to which the plants had been offered. The first marked O. *oxen*—the second G. *goats*—the third Sh. *sheep*—the fourth H. *horses*—and the fifth Sw. *swine*.

The marks in these columns, opposite to the name of every plant, show whether that plant was eat or refused by the animals expressed in each column.—By the mark (r) is denoted that the plant was eaten; by the mark (o) that it was refused; and by both of these (ro) or (or) that it was sometimes eat, and sometimes refused: The letter (n) denotes that it was not tried with the particular animal in whose column it is placed, although there is no explanation of this in the original work.

The Swedish naturalist arranged the plants according to the order they hold in the *Flora Suecica* of Linnæus.—I have thought it better to alter that arrangement to one which, I imagine, is better adapted to the use of the farmer,—and which is divided into classes, according

according to the number of animals that eat each plant.

The first class contains such plants as were either eat by all the five classes of animals, or only rejected by one of them.

The second class contains those that were eat by four, or rejected only by two.

The third contains those that were eat by three, or rejected by three.

The fourth contains those that were eat by two, or rejected by four.

The fifth contains those that were not eat by any animal at all.

This arrangement is only broke through in some cases, where a plant or two are placed with others of the same species, although differing a little from the others.

There are in the original table many plants that were not tried at all.—These are here entirely omitted.

To assist the reader to turn to any plant he may wish to examine, a Latin and an English index are subjoined.

		O.	G.	Sh.	H.	Sw.
19	<i>Poa alpina</i> . Alpine meadow grafs,					
20	<i>Briza media</i> . Middle quaking grafs, cow quakes, and ladies hair, P VI.	I	I	I	I	n
21	<i>Cynofurus Cristatus</i> . Crested dog's tail grafs, P VIII. Tab. X.	I	I	I	I	n
22	— <i>caeruleus</i> . Blue dogs tail grafs, P VII.	n	I	I	I	n
23	<i>Dactylis glomeratus</i> . Rough cocks foot grafs, P. VI.—VIII.	n	I	I	I	O
24	<i>Bromus secalinus</i> . Field brome grafs, A V. VI.	O	I	I	I	n
25	— <i>arvensis</i> . Corn brome grafs, P VII.	I	I	I	I	n
26	— <i>giganteus</i> . Tall brome grafs, P. VIII.	I	I	I	I	n
27	— <i>pinnatus</i> . Spiked brome grafs, P VI.	I	I	I	I	n
28	<i>Festuca fluitans</i> . Flote fescue grafs, P VI. VII.	n	I	I	I	n
29	— <i>rubra</i> . Purple fescue grafs, P. VI. * Tab. III.	I	I	I	I	O
30	— <i>ovina</i> . Sheeps fescue grafs, P VI. VII. Tab. IV.	n	I	I	I	n
31	<i>Avena pratensis</i> . Meadow oat-grafs, goose grafs vulgo, P VII.	I	I	I	I	n
32	— <i>fatua</i> . Bearded oat grafs, P VIII.	I	I	I	I	n
33	— <i>elatior</i> . Tall oat grafs, knot grafs vulgo, P VII. VIII.	n	I	I	I	n
34	<i>Arundo phragmites</i> . Common reed grafs, P VII.	I	I	I	I	O
35	— <i>calamagrostis</i> . Branched reed grafs, P VI. VII.	I	I	I	I	n
36	<i>Triticum repens</i> . Common wheat grafs, dogs grafs, quick grafs, or couch grafs, P VI.—VIII. †	n	I	I	I	n
		I	I	I	I	O

* Sheep I have found delight much to pasture on fields that abound with the purple fescue grafs, and eat them quite bare.

† This grafs is not much liked either by oxen or horses.

		O.	G.	Sh.	H.	Sw.
37	<i>Scabiosa arvensis.</i>	-	-	-	-	-
38	— <i>columbaria.</i>	10	1	1	10	0
39	— <i>succisa.</i>	n	1	1	1	n
40	<i>Asperula odorata.</i>	1	1	1	1	0
41	— <i>tinctoria,</i>	1	1	1	1	0
42	<i>Galium aparine.</i>	1	1	1	1	0
43	— <i>uliginosum.</i>	1	1	1	1	1
44	<i>Sanguisorba officinalis.</i>	1	1	1	1	n
45	<i>Anchusa officinalis.</i>	1	1	1	1	10
46	<i>Asperuga procumbens.</i>	1	1	1	1	1
	madwort, A IV. V.					
47	<i>Ulmus campestris.</i>	10	1	1	1	1
48	<i>Laserpitium latifolium,</i>	1	1	1	1	1
49	<i>Heracleum sphondylium.</i>	1	1	1	1	1
50	<i>Pimpinella saxifraga.</i>	1	1	1	10	1
51	<i>Convallaria bifolia,</i>	1	1	1	1	1
52	<i>Rumex acetosa.</i>	1	1	1	1	1
53	— <i>acetosella.</i>	1	1	1	1	1
54	<i>Triglochin palustre.</i>	1	1	1	1	1
55	— <i>maritimum.</i>	1	1	1	1	1
56	<i>Sorbus aucuparia.</i>	1	1	1	1	1
57	<i>Pyrus communis.</i>	1	1	1	1	n
58	— <i>malus.</i>	1	1	1	1	n

Common field scabious, P VIII.

The lesser field scabious, P VIII.

Devil's bit, P VI.—VIII.

Woodroof, P V.

Cleavers, or goose grafs, A V. VI.

Marsh goose grafs, P VII. VIII.

Burnet, P

Hounds tongue, P VI.

Small wild buglofs, great goose grafs, and German

madwort, A IV. V.

Common elm tree, P

Cow parsnip B VII.

Small Burnet saxifrage, P VIII.

Common sorrel,

Sheeps sorrel, P V. VI. VII.

Arrow headed grafs, P VII. VIII.

Sea spiked grafs, P V. VI.

Quicken, raven tree, or mountain ash, T V.

The wild pear tree, T IV.

The apple tree, T IV.

		O.	G.	Sh.	H.	Sw.
59	<i>Mespilus cotoneaster</i> . The medlar, T V.	I	I	I	I	n
60	<i>Rosa canina</i> . Dog rose or hip tree, T V. VI.	I	I	I	IO	I
61	— <i>spinossima</i> . Burnet rose, T VI.	I	I	I	O	I
62	<i>Rubus idaeus</i> . Raspberry bush, T V. VI.	O	I	I	O	I
63	— <i>fruticosus</i> . Bramble, T V.—IX.	n	I	IO	I	n
64	— <i>caesias</i> . Small bramble, or Dewberry bush, T VI.	I	I	I	O	n
65	— <i>saxatilis</i> . Stone bramble, P VI.	I	I	I	O	I
66	— <i>Cbamaemorus</i> . Cloud berries, or knout berries, P V. VI.	I	I	I	I	n
67	<i>Fragaria vesca</i> . Strawberry, P IV.	IO	I	I	I	O
68	<i>Potentilla fruticosa</i> . Shrub cinquefoil, T VI.	I	I	I	I	O
69	— <i>argentea</i> . Silver weed, or wild tansey, P VI. VII.	O	I	O	I	O
70	— <i>repens</i> . Common cinquefoil, or five leaved grafs, P VI.	I	I	I	I	n
71	— <i>verna</i> . Spring cinquefoil, P V. VI.	I	I	I	I	n
72	— <i>rupestris</i> . Upright bastard cinquefoil, P VII.	I	I	I	I	n
73	— <i>norvegica</i> . Norwegian cinquefoil,	I	I	I	I	I
74	<i>Thalictrum flavum</i> . Meadow rue P VI.	I	I	I	I	IO
75	<i>Euphrasia officinalis</i> . Eyebright, A VIII. IX.	I	I	I	I	O
76	— <i>odontites</i> . Red eyebright, A VIII. IX.	I	I	I	I	n
77	<i>Thlaspi bursa pastoris</i> . Shepherd's purse, A III. IV.	I	I	I	I	I
78	<i>Myagarum sativum</i> . Gold of pleasure, A VI.	I	I	I	I	n
79	<i>Crambe maritima</i> . Sea Colwort, P V.	I	I	I	I	I
80	<i>Geranium sanguineum</i> . Bloody crane's bill, P VII. VIII.	I	I	n	I	I
81	— <i>sylvaticum</i> . Mountain ditto, P VII. VIII.	I	I	I	I	O

		O.	G.	Sh.	H.	Sw.
82	<i>Geranium pratense</i> . Crowfoot cranebill, P VI. VII.	-				
83	— <i>rotundifolium</i> . Round leaved cranebill, A VII.	-				
84	— <i>columbinum</i> . Long stalked doves foot cranebill, A VII.	-				
85	— <i>molle</i> . Common doves foot cranebill, A V VI.	-				
86	— <i>robertianum</i> . Herb Robert, B IV.	-				
87	— <i>cicutinum</i> . Hemlock leaved cranebill, A IV.—VI.	-				
88	<i>Polygala vulgaris</i> . Milkwort, P V. VI. Tab. XI.	-				
89	<i>Genista tinctoria</i> . Greenwood, dyers weed, or wood waxen, T VII.	-				
90	<i>Astragalus glycyphyllos</i> . Wild liquorice, P VI. VII.	-				
91	<i>Anthyllis vulneraria</i> . Kidney vetch, or lady's finger, P VII.	-				
92	<i>Orobanchus tuberosus</i> . Wood pease, or heath pease, P V.	-				
93	— <i>niger</i> . Black wood pease,	-				
94	— <i>vernus</i> . Early wood pease,	-				
95	<i>Lathyrus sylvestris</i> . Narrow leaved pease everlasting, P VII. VIII.	-				
96	— <i>beterophyllus</i> ,	-				
97	— <i>pratensis</i> . Tare everlasting or common yellow vetchling, P VII. VIII. Tab. XII.	-				
98	— <i>palustris</i> . Marsh chickling vetch, P VII. VIII.	-				
99	<i>Vicia sativa</i> . Common vetch, or tare, A V. VI.	-				
100	— <i>sepium</i> . Bush vetch, P V. Tab. XIV.	-				
101	— <i>sylvatica</i> . Tufted wood vetch, P VII. VIII.	-				
102	— <i>cracca</i> . Tufted vetch, P VII. VIII.	-				
103	<i>Ervum tetraspermum</i> . Smooth tare, A IV. V.	-				

				O. G.	Sh.	H. Sw.
104	<i>Ervum hirsutum.</i>	Hairy tare, A VI.	-	I	I	I
105	<i>Pisum arvense.</i>	Common pease, A	-	I	I	I
106	— <i>maritimum.</i>	Sea pease, P VII.	-	I	I	I
107	<i>Lotus corniculata.</i>	Birds foot trefoil, P VI.—VIII.	-	I	I	I
108	<i>Trifolium repens.</i>	Dutch clover, white trefoil, P VI.—IX.	-	I	I	I
109	— <i>pratense.</i>	Purple or honey suckle trefoil, T V.—IX.	-	I	I	I
110	— <i>arvense.</i>	Hares foot trefoil, A VII. VIII.	-	I	I	I
111	— <i>agrarium.</i>	Hop trefoil, A VI.	-	I	I	I
112	— <i>procumbens.</i>	Decumbent, or creeping trefoil, P V.—VIII.	-	I	I	I
113	— <i>melilotus.</i>	Common melilot, B VI. VII.	-	I	I	I
114	<i>Medicago falcata.</i>	Yellow medick, P VII.	-	I	I	I
115	— <i>lupulina.</i>	Melilot trefoil, A V.—VIII.	-	I	I	I
116	<i>Ononis mitis.</i>	Creeping rest harrow, P	-	I	I	I
117	— <i>spinosa.</i>	Rest harrow, or cammock, P VI.—VIII.	-	I	I	I
118	<i>Sonchus arvensis.</i>	Tree sow thistle, P VIII.	-	I	I	I
119	— <i>oleraceus.</i>	Common sow thistle, A VI.—VIII.	-	I	I	I
120	— <i>alpinus.</i>	Mountain sow thistle,	-	I	I	I
121	<i>Prenanthis muralis.</i>	Ivy leaved wild lettuce, P VII.	-	I	I	I
122	<i>Scorzonera humilis,</i>	-	-	I	I	I
123	<i>Tragopogon pratense.</i>	Yellow goats beard, B VI.	-	I	I	I
124	<i>Carduus lanceolatus.</i>	Spear thistle, B VII.	-	I	I	I
125	— <i>nutans.</i>	Musk thistle, B VII.	-	I	I	I
126	— <i>acaulis.</i>	Dwarf caroline thistle, P VII.	-	I	I	I

		O.	G.	Sh.	H.	Sw.
127	<i>Carduus heterophyllus</i> ,	-	-	-	-	-
128	— <i>crispus</i> . Curled thistle, A VI.	-	-	-	-	-
129	— <i>palustris</i> . Marsh thistle, P VII.	-	-	-	-	-
130	<i>Solidago virga aurea</i> . Common golden rod, P VIII.	-	-	-	-	-
131	<i>Achillea millefolium</i> . Common yarrow, or millfoil, P V. VII. * Tab. XVII.	-	-	-	-	-
132	— <i>ptarmica</i> . Sneezewort, or goose tongue, P VIII.	-	-	-	-	-
133	<i>Centaurea scabiosa</i> . Great knapweed, or matfellow, P VI. VII.	-	-	-	-	-
134	— <i>jacea</i> . Common knapweed, or matfellow, P VII. VIII.	-	-	-	-	-
135	— <i>cyanus</i> . Blue bottles, A VII.	-	-	-	-	-
136	<i>Humulus lupulus</i> . The hop plant, P VI.	-	-	-	-	-

§ II.

137	<i>Scirpus sylvaticus</i> . Millet cyperus gras, P VII.	-	-	-	-	-
138	— <i>maritimus</i> . Round rooted bastard cyperus, P VIII.	-	-	-	-	-
139	— <i>lacustris</i> . Bull rush, P VII. VIII.	-	-	-	-	-
140	— <i>palustris</i> . Club rush, P. VII.	-	-	-	-	-
141	— <i>caespitosus</i> . Dwarf club rush, P VII.	-	-	-	-	-
142	<i>Nardus stricta</i> . Mat gras, P VI. VII.	-	-	-	-	-

* The finest pastures I ever saw, those especially on which horses, cattle, and sheep, chiefly delighted to feed, always abounded with this gras.

		O.	G.	Sh.	H.	Sw.
143	<i>Phalaris arundinacea</i> . Reed canary gras, P VII.	1	1	1	1	0
144	— <i>phleoides</i> , — — —	n	1	1	n	0
145	<i>Phtem pratenſe</i> . Meadow cattſ tail gras, P VII.	1	1	n	1	0
146	<i>Alopecurus pratenſis</i> . Meadow foxtail gras, P V.	10	1	1	1	10
147	— <i>geniculatus</i> . Flote fox tail gras, P VI.—VIII.	1	1	1	1	0
148	<i>Melica nutans</i> . Melic gras, P VI. VII.	1	1	n	1	n
149	— <i>ciliata</i> . — — —	n	1	n	1	n
150	<i>Agroſtis ſpica venti</i> . Silky bent gras, A VII.	n	1	0	1	n
151	— <i>arundinacea</i> , — — —	n	0	n	1	n
152	— <i>rubra</i> . Red bent gras, A VII.	n	0	10	1	n
153	— <i>ſolonifera</i> . Creeping bent gras, P VIII.	1	n	1	1	n
154	— <i>tenuiſſima</i> . Fine bent gras, P VIII.*	1	1	n	1	n
155	— <i>canina</i> . Brown bent gras, P VI. VIII.	1	n	n	1	n
156	<i>Gallium verum</i> . Yellow ladies bedſtraw or cheese renning, P VII. VIII.	10	1	1	0	0
157	— <i>mollugo</i> . Wild madder or great baſtard madder, P VI. VII.	1	1	1	0	1
158	— <i>borealis</i> , — — —	10	1	1	1	0
159	— <i>paluſtre</i> . White ladies bedſtraw, P VII.	1	0	1	1	0
160	<i>Sherardia arvenſis</i> . Little field madder, A V. VI.	0	1	10	1	n
161	<i>Cornus ſanguinea</i> . Cornel or dog berry tree, T VI.	0	1	1	1	0

* Horſes, cattle, and ſheep, will eat this gras; but they leave it for almoſt any other fort, and always ſtay with reluctance on the fields where it abounds.

		Ox.	G.	Sh.	H.	Sw.
185	<i>Phellandrium aquaticum.</i>					
186	<i>Cicuta virosa.</i>					
187	<i>Æthusa cynapium.</i>					
188	<i>Scandix anthriscus.</i>					
	Small hemlock chervil, with rough seeds, A V.					
	VI.					
189	— <i>cerefolium.</i>					
190	<i>Chaerophyllum sylvestre.</i>					
191	— <i>temulum.</i>					
192	<i>Carum carvi.</i>					
193	<i>Aegopodium podagraria.</i>					
194	<i>Apium graveolens.</i>					
195	<i>Viburnum epulus.</i>					
196	<i>Linum catharticum.</i>					
197	<i>Ornithogalum luteum.</i>					
198	— <i>minimum.</i>					
199	<i>Juncus effusus.</i>					
200	— <i>glomeratus.</i>					
201	— <i>squarrosus.</i>					
	Moss rush, or goose-corn, P VI.					

* I have found, by experience, that sheep eat this in the field early in the spring. Cattle usually do not eat it while growing,—and sometimes reject it when given them by the hand; but, after they have been accustomed to it for some time, they eat it as greedily as any plant whatever.

		Ox.	G.	Sh.	H.	Sw.
202	<i>Juncus bufonius</i> . Toad rush, A VII. VIII.	n	n	n	i	n
203	— <i>bulbosus</i> . Bulbous rush, P VII.	i	i	i	i	n
204	— <i>pilosus</i> . Common hairy wood rush or grass, P IX.	o	i	i	i	n
205	— <i>campestris</i> . Small hairy wood rush, P IV.	n	i	i	i	n
206	<i>Trientalis Europaea</i> . Chickweed, winter green, P VI.	o	i	i	i	n
207	<i>Epilobium angustifolium</i> . Rosebay willow herb, P VII. VIII.	i	i	i	o	o
208	— <i>hirsutum</i> . Small flowered hairy willow herb, P VII.	o	i	i	i	o
209	— <i>montanum</i> . Smooth leaved willow herb, B VI.	i	i	i	i	o
210	— <i>palustre</i> . Marsh willow herb, P VII.	n	i	n	i	o
211	<i>Erica vulgaris</i> . Common heath, or ling, T VI.—VIII.	n	i	i	i	o
212	— <i>tetralix</i> . Cross leaved heath, T VII. VIII.	i	o	i	i	o
213	<i>Vaccinium uliginosum</i> . The great bilberry bush, T IV. V.	n	i	n	i	o
214	— <i>myrtillus</i> . Black whortleberries, or bilberries, T IV. V.	i	i	i	i	o
215	— <i>vitis idaea</i> . Red whortleberries, T IV. V.	o	i	i	o	n
216	— <i>oxycoccus</i> . Cranberries, moss, or moor-berries, T IV. V.	o	i	o	o	i
217	<i>Polygonum amphibium</i> . Perennial arsmart, P VI. VII.	o	i	i	i	i
218	— <i>persicaria</i> . Dead or spotted arsmart, A VIII. IX.	o	i	i	i	o
219	— <i>viviparum</i> . Small bistort, or snakeweed, P VI.	i	i	i	o	i
220	— <i>aviculare</i> . Knot grass, A VI.—IX.	i	i	i	i	i
221	— <i>convolvulus</i> . Black bindweed, A VI.—IX.	i	i	i	i	o
222	— <i>fagopyrum</i> . Buck wheat, or brank, A VII. VIII.	i	i	i	o	o
223	<i>Dianthus deltoides</i> . Maiden pinks, P VI. VII.	i	i	i	i	o
224	— <i>arenarius</i> . Stone pink, P VII.	i	i	i	i	n

		Ox.	G.	Sh.	H.	Sw.
225	<i>Dianthus armeria.</i>					
226	<i>Cucubalus behen.</i>					
227	— <i>dioicus,</i>					
228	<i>Silene nutans.</i>					
229	— <i>rupestris,</i>					
230	— <i>viscaria,</i>					
231	<i>Alfane media.</i>					
232	<i>Stellaria graminea.</i>					
233	— <i>pentagyna,</i>					
234	<i>Spergula arvensis.</i>					
235	<i>Agrostemma githaco.</i>					
236	<i>Lychnis flos cuculi.</i>					
	P VI.					
237	<i>Oxalis acetosella.</i>					
238	<i>Sedum telephium.</i>					
239	— <i>album.</i>					
240	— <i>acre.</i>					
241	— <i>sexangularis.</i>					
242	<i>Lythrum salicaria.</i>					
243	<i>Prunus padus.</i>					

Deptford Pink, A VII.
 Bladder campion, or white corn campion, P VII.
 Nottingham catchfly, P VI. VII.
 Common chickweed, A I. III.
 Lesser stitchwort, P VII.
 Corn spurrey, yarr, A VIII. *
 Cockle, A VI.
 Meadow pinks, wild Williams, or cuckow flower,
 P VI.
 Wood forrel, P IV.
 Orpine, or live long, P VIII.
 White stone crop, P VI. VII.
 Wall stone crop, or pepper, P VI.
 Infipid stone crop, B VII.
 Purple spiked loofe strife, or willow herb, P VII.
 Wild cluster, or bird cherry, T V.

* There is no plant I know that cattle or sheep are more greedy of eating green,—either as it grows, or when cut, than this one.

		Ox.	G.	Sh.	H.	Sw.
244	<i>Prunus spinosa</i> . Black thorn, or sloe tree, T III. IV.	n	i	i	i	n
245	<i>Crataegus aria</i> . White beam tree, T V.	n	i	i	n	n
246	— <i>oxycantha</i> . White thorn, or hawtree, T V.	i	i	io	i	n
247	<i>Spirea filipendula</i> . Dropwort, T VII.	i	i	i	o	i
248	— <i>ulmaria</i> . Meadow sweet, P VI. VII.	o	i	i	o	i
249	<i>Tormentilla erecta</i> . Tormentil, or septfoil, P VI.	i	i	i	o	i
250	<i>Comarum palustre</i> . Purple marsh cinquefoil, P VI.	io	i	io	o	o
251	<i>Geum urbanum</i> . Common avens, or herb-bennet, P VI. VII.	i	i	i	io	i
252	— <i>rivale</i> . Water avens, P VII.	oi	i	i	io	io
253	<i>Tilia europaea</i> . Lime, or Linden tree, T VII.	i	i	i	i	n
254	<i>Cistus helianthemum</i> . Dwarf cistus, or little sunflower, P VII.	n	i	i	i	o
255	<i>Lionurus cardiaca</i> . Motherwort, B VII.	oi	i	i	i	o
256	<i>Prunella vulgaris</i> . Self-heal, P VIII.	i	i	i	io	n
257	<i>Scutellaria galericulata</i> . Hooded willow herb, P VIII.	i	i	i	o	o
258	<i>Melampyrum cristatum</i> . Crested cow wheat, A VII.	i	i	i	o	o
259	— <i>arvense</i> . Purple cow wheat, A VII.	i	i	o	n	n
260	— <i>nemorum</i> .	i	i	i	i	n
261	— <i>pratense</i> . Meadow cow wheat, A VII.	i	i	i	o	o
262	— <i>sylvaticum</i> . Yellow cow wheat, A VI.—VIII.	i	i	i	n	n
263	<i>Euphrasia officinalis</i> . Eyebright, A VIII. IX.	i	i	i	i	o
264	— <i>odonites</i> . Red eyebright, A VIII. IX.	i	i	i	i	n

		Ox.	G.	Sh.	H.	Sw.
265	<i>Draba verna.</i>					
266	— <i>incana.</i>	10	1	1	1	0
267	<i>Brassica campestris.</i>	10	1	1	1	0
268	— <i>napus.</i>	1	1	1	1	1
269	<i>Sinapis arvensis.</i>	1	1	1	1	1
270	<i>Sisymbrium amphibium.</i>	0	1	1	1	1
271	— <i>pinnatifidum.</i>	1	1	1	1	1
272	— <i>sopbia.</i>	1	10	1	10	0
273	<i>Erysimum officinale.</i>	0	1	1	1	0
274	— <i>cheriantoides.</i>	1	1	1	1	1
275	— <i>barbarea.</i>	1	10	10	0	0
276	— <i>Alliaria.</i>	1	1	0	0	0
277	<i>Malva rotundifolia.</i>	0	1	0	1	1
278	— <i>sylvestris.</i>	1	1	1	1	1
279	— <i>alcea.</i>	1	1	1	1	1
280	— <i>moschata.</i>	1	1	1	1	1
281	<i>Leontodon taraxacum.</i>	1	1	1	1	1
282	— <i>autumnale.</i>	1	1	1	1	1
283	<i>Hypochaeris maculata.</i>	1	1	1	1	1
284	<i>Hieracium alpinum.</i>	1	1	1	1	1

* I have remarked that sheep are extremely fond of all the plants of this class as well as the leontodons.

		Ox.	G.	Sh.	H.	Sw.
285	<i>Hieracium pilosella</i> . Common creeping moufe-ear, A V.	-	-	-	-	-
286	— <i>dubium</i> . Moufe-ear hawkweed, P VII. VIII.	-	-	-	-	-
287	— <i>auriculata</i> . Narrow leaved hawkweed, P VII.	-	-	-	-	-
288	— <i>praenorsum</i> , —	-	-	-	-	-
289	— <i>murorum</i> . French, or golden lungwort, P VII.	-	-	-	-	-
290	— <i>umbellatum</i> . Narrow leaved bushy hawkweed, P VII. VIII. *	-	-	-	-	-
291	<i>Crepis testorum</i> . Smooth succory hawkweed, A. VI.—IX.	-	-	-	-	-
292	<i>Lapsana communis</i> . Nipplewort, A VI. VII.	-	-	-	-	-
293	<i>Serratula tinctoria</i> . Saw-wort, P VII.	-	-	-	-	-
294	— <i>alpina</i> . Mountain saw-wort, P VII.	-	-	-	-	-
295	— <i>arvensis</i> . Corn saw-wort, or way thistle, P VII.	-	-	-	-	-
296	<i>Tuffilago farfara</i> . Common coltsfoot, P III.	-	-	-	-	-
297	— <i>petasites</i> . Common butter bur, P III. IV.	-	-	-	-	-
298	<i>Arnica montana</i> , —	-	-	-	-	-
299	<i>Matricaria suaveolens</i> . Sweet scented fever-few, A V.	-	-	-	-	-
300	— <i>chamomilla</i> . Corn fever-few, A V.	-	-	-	-	-
301	<i>Viola odorata</i> . Sweet violet, P III.	-	-	-	-	-
302	— <i>canina</i> . Dogs violet, P IV.	-	-	-	-	-
303	— <i>palustris</i> . Marsh violet, P VI.	-	-	-	-	-
304	— <i>hirsuta</i> . Hairy violet, P III.	-	-	-	-	-
305	— <i>mirabilis</i> , —	-	-	-	-	-
306	— <i>biflora</i> , —	-	-	-	-	-

				Ox.	G.	Sh.	H.	Sw
307	<i>Viola tricolor.</i>	Pansies, or heart's ease, A V.---IX.	-	I	I	O	O	I O
308	<i>Carex vulpina.</i>	Great carex, P VII.	-	n	I	n	I	O
309	— <i>muricata.</i>	Prickly carex, P VI.	-	n	I	n	I	n
310	— <i>digitata,</i>	-	-	n	n	I	n	n
311	— <i>globularis,</i>	-	-	n	I	n	n	n
312	— <i>fliformis,</i>	-	-	n	I	n	n	n
313	— <i>capillaris,</i>	-	-	I	n	I	n	I
314	— <i>panicea.</i>	Pink carex, P VI. VII.	-	I	I	I	n	n
315	— <i>pseudo-cyperus.</i>	Bastard carex, P VII.	-	I	I	I	n	n
316	— <i>caespitosa.</i>	Turfy carex, P V. VI.	-	I	I	I	I	n
317	— <i>vesicaria.</i>	Greater bladder carex, A VI.	-	I	I	I	I	n
318	— <i>acuta.</i>	Brown carex, P V.	-	I	I	I	I	O
319	<i>Betula alba.</i>	The birch tree, T VII.	-	I	I	I	I	O
320	— <i>alnus,</i>	-	-	I	I	I	I	O
321	— <i>nana.</i>	Dwarf birch, -	-	I	I	I	I	O
322	<i>Quercus robur.</i>	The oak tree, T IV.	-	I	I	I	I	n
323	<i>Fagus sylvatica.</i>	The beech tree, T V.	-	I	I	I	I	n
324	<i>Carpinus betulus.</i>	The hornbeam tree, T V.	-	I	I	I	I	n
325	<i>Salix pentandria.</i>	Sweet willow, T IV.	-	n	I	n	I	n
326	— <i>amygdalina.</i>	Almond leaved willow, T V.	-	n	I	n	I	n
327	— <i>cinerea,</i>	-	-	n	I	n	I	n
328	— <i>caprea.</i>	Common fallow, T IV. V.	-	n	I	n	I	n
329	— <i>alba.</i>	Common white willow, T IV.	-	I	I	I	I	I

330	<i>Salix viminalis.</i>	The osier,	T IV.	-	I	I	I	I	n	n	O. G. Sh. H. Sw.
331	<i>Hippophae rhamnoides.</i>	Sallow thorn, or sea buckthorn,	T IV.	-	I	I	I	I	n	n	
332	<i>Populus tremula.</i>	Trembling poplar, or asp tree,	T III.	-	n	I	I	I	O	O	
333	— <i>alba.</i>	White poplar,	T III.	-	IO	I	I	I	I	n	
334	— <i>nigra.</i>	Black poplar,	T III.	-	I	I	I	I	n	n	
335	<i>Mercurialis perennis.</i>	Dogs mercury,	P IV. V.	-	O	I	I	I	n	n	
336	<i>Juniperus communis.</i>	Common juniper,	T V.	-	n	I	I	I	n	n	
337	<i>Atriplex laciniata.</i>	Jagged sea orache, A VIII.	-	-	I	n	n	n	n	n	
338	— <i>bastata.</i>	Wild orache, A VIII. IX.	-	-	I	n	n	n	n	n	
339	— <i>patula.</i>	Narrow leaved orache, A VIII.	-	-	I	I	I	I	n	I	
340	— <i>portulacoides.</i>	Sea purslain,	T VIII.	-	I	I	I	I	I	O	
341	<i>Fraxinus excelsior.</i>	Common ash tree,	T III. IV.	-	I	I	I	I	I	O	
342	<i>Esfisetum arvense.</i>	Corn horse tail,	P III.	-	O	I	IO	O	n	n	
343	— <i>sylvaticum.</i>	Wood horse tail,	P IV. V.	-	n	I	I	n	I	n	
344	— <i>palustre.</i>	Marsh horse tail,	P VI.	-	n	I	I	n	n	n	
345	— <i>fluviatile.</i>	River horse tail,	P V.	-	IO	I	I	I	I	I	
346	— <i>hyemale.</i>	Rough horse tail, or Shave grass,	P VII. VIII.	-	O	I	O	n	I	IO	

§ III.

347	<i>Ligustrum vulgare.</i>	Privet, or Prim, T V.	-	-	I	I	I	O	O
348	<i>Veronica maritima.</i>	-	-	-	I	I	I	O	O
349	— <i>spicata.</i>	Upright spiked male speedwell, or Flewellin, P VI.	-	-	I	O	I	O	n

		O.	G.	Sh.	H.	Sw.
350	<i>Veronica anagallis.</i>					
351	— <i>— becabungae.</i>					
352	— <i>— chamaedrys.</i>					
353	— <i>— alpina.</i>					
354	— <i>— serpyllifolia.</i>					
355	— <i>— peregrina.</i>					
356	— <i>— arvensis.</i>					
357	<i>Elymus arenarius.</i>					
358	<i>Hordeum murinum.</i>					
359	<i>Plantago major.</i>					
360	— <i>— media.</i>					
361	— <i>— lanceolata.</i>					
	Tab. XV.					
362	— <i>— dubia.</i>					
363	— <i>— coronopus.</i>					
364	— <i>— maritima.</i>					
365	<i>Lithospermum officinale.</i>					
366	— <i>— arvense.</i>					
367	<i>Pulmonaria officinalis.</i>					
368	<i>Primula vulgaris.</i>					

* *Plantago lanceolata.* Cattle eat this plant very readily, as I have often experienced.

369	<i>Primula farinosa.</i>	Birds eye, P V.	-	-	O	I	I	I	n	n	Ox. G. Sh. H. Sw.
370	<i>Samolus valerandi.</i>	Round leaved water pimpernel, P VI.	-	-	O	I	I	O	n	n	
371	<i>Lysimachia vulgaris.</i>	Yellow willow-herb, or loofefrife, P VI. VII.	-	-	I	I	I	O	O	O	
372	— <i>thyriflora.</i>	Tufted loofefrife, P VI.	-	-	O	I	I	O	O	O	
373	— <i>nummularia.</i>	Money wort, P VI.	-	-	I	O	I	O	n	n	
374	<i>Lonicera periclymenum.</i>	Common honeysuckle or woodbine, T V. VI.	-	-	I	I	I	O	n	n	
375	— <i>Xylosteum.</i>	-	-	-	O	I	I	O	n	n	
376	<i>Rhamnus catharticus.</i>	Buckthorn, T IV. V.	-	-	O	I	I	I	n	n	
377	— <i>frangula.</i>	Blackberry bearing alder, T IV. V.	-	-	O	I	I	I	n	n	
378	<i>Herniaria glabra.</i>	Smooth rupturewort, A VII.	-	-	I	O	I	I	O	O	
379	<i>Chenopodium benricus.</i>	Common Englilh mercury or allgood, P VIII.	-	-	O	O	I	O	O	O	
380	— <i>urbicum.</i>	Upright blite, A VIII. IX.	-	-	O	I	I	O	n	n	
381	— <i>rubrum.</i>	Sharp leaved goofe-foot, A VIII.	-	-	I	I	I	O	I	I	
382	— <i>murale.</i>	Common goofe-foot or fowbane, A VIII.	-	-	I	n	n	n	n	n	
383	— <i>album.</i>	Common orache, A VIII.	-	-	I	I	I	O	I	O	
384	— <i>hybridum.</i>	Mapple-leaved blite, A VIII.	-	-	I	O	I	O	O	O	
385	— <i>viride.</i>	Green blite, A	-	-	n	I	I	I	n	I	
386	— <i>glaucum.</i>	Oak leaved blite, A VIII.	-	-	I	n	n	I	n	I	
387	— <i>vulvaria.</i>	Stinking orache, A VIII.	-	-	I	I	I	I	O	n	
388	— <i>polypermum.</i>	Round leaved blite, or all-feed, A	-	-	I	O	I	O	n	I	
389	<i>Athamanta libanotis.</i>	Mountain ftone-parfley, P VIII. IX.	-	-	O	n	I	n	I	I	
390	<i>Sium fatifolium.</i>	Great water-parfnip, P VII. VIII.	-	-	O	O	O	I	I	I	
391	<i>Parnaffia vulgaris.</i>	Grafs of Parnaffus, P VIII.	-	-	O	I	O	I	I	O	

		O.	G.	Sh.	H.	Sw.
392	<i>Statice armeria.</i>	-	-	-	-	-
393	— <i>limonium.</i>	-	-	-	-	-
394	<i>Allium ursinum.</i>	-	-	-	-	-
395	— <i>scorodoprasum,</i>	-	-	-	-	-
396	— <i>oleraceum.</i>	-	-	-	-	-
397	<i>Asparagus officinalis.</i>	-	-	-	-	-
398	<i>Convallaria majalis.</i>	-	-	-	-	-
399	— <i>multiflora.</i>	-	-	-	-	-
400	— <i>polygonatum.</i>	-	-	-	-	-
401	<i>Berberis vulgaris.</i>	-	-	-	-	-
402	<i>Acer platanoides.</i>	-	-	-	-	-
403	<i>Papaver dubium.</i>	-	-	-	-	-
404	— <i>rhaeas.</i>	-	-	-	-	-
405	<i>Euphorbia helioscopia.</i>	-	-	-	-	-
406	— <i>peplus.</i>	-	-	-	-	-
407	— <i>palustris,</i>	-	-	-	-	-
408	<i>Delphinium consolida.</i>	-	-	-	-	-
409	<i>Trollius Europaeus.</i>	-	-	-	-	-
410	<i>Ajuga pyramidalis.</i>	-	-	-	-	-
411	<i>Origanum vulgare.</i>	-	-	-	-	-
412	<i>Mentha arvensis.</i>	-	-	-	-	-
413	— <i>aquatica.</i>	-	-	-	-	-
414	<i>Galeopsis tetrahit.</i>	-	-	-	-	-

Thrift, sea-gillyflower, P VII. VIII.

Sea-lavender, P VII. VIII.

Ramson, P V.

Wild garlic, P VII.

Sparagus or sperage, P VII. VIII.

Cornwall lily, or May lily, P V.

Solomon's seal, P V. VI.

Sweet-smelling Solomon's seal, P V.

Barberry, or pepperidge bush, T.

Mapple tree, T

Long smooth headed poppy, A VI. VII.

Red corn poppy, A VII. VII.

Sunspurge or wartwort, A VII.

Petty spurge, A VII.

Wild larkspur, A VI.

Globe-flower, or Locker gowans, P V VI.

Mountain-bugle or sicklewort, P VI.

Wild marjorum, P VII.

Corn mint, P VIII. IX.

Water mint, P VII.

Nettle hemp, or hemp-leaved dead nettle, T VIII.

415	Rhinanthus <i>crista galli.</i>	Yellow rattle, or cocks-comb, A VI. VII.	O	I	I	I	n
416	Lathrea <i>squamaris.</i>	Toothwort, P IV. V.	-	-	-	-	-
417	Alyssum <i>incanum.</i>	-	-	-	-	-	-
418	Thlaspi <i>arvense.</i>	Treacle mustard, or penny-cress, A VI. VII.	IO	I	I	O	n
419	— <i>campestre.</i>	Mithridate mustard, or bastard cress, A VII.	IO	I	I	O	I
420	Lepidium <i>perenne.</i>	Dittander, or pepperwort, P VI. VII.	I	I	I	O	n
421	— <i>ofyris.</i>	-	-	-	-	-	-
422	Turritis <i>glabra.</i>	Great tower-mustard, A V.	I	I	I	O	O
423	— <i>hirsuta.</i>	Hairy tower-mustard, B VI.	O	n	n	n	n
424	Cardamine <i>pratensis.</i>	Common ladies smoke, or cuckow flower, P IV.	IO	I	I	O	O
425	— <i>amara.</i>	Bitter cresses, or ladies smoke, P IV. V.	IO	n	I	n	n
426	Fumaria <i>officinalis.</i>	Fumitory, A IV.—VI.	I	IO	I	O	O
427	— <i>bulbosa.</i>	-	IO	I	n	n	n
428	Hypericum <i>quadrangulare.</i>	St. Peter's wort, P VII.	I	I	I	O	O
429	— <i>perforatum.</i>	St. John's wort, P. VII.	I	I	I	O	O
430	— <i>hirsutum.</i>	Tutian, or hairy St. John's wort, P VII.	n	n	I	O	n
431	Chicorium <i>intybus.</i>	Wild succory, B VII. VIII.	O	I	I	O	I
432	Arctium <i>lappa.</i>	Burdock, or clot-bur, P. VII. VIII.	I	I	O	O	O
433	Artemisia <i>vulgaris.</i>	Mugwort, P VIII.*	IO	IO	O	IO	O
434	— <i>campestris.</i>	Field southernwood, P VIII.	-	-	-	-	-

* *Artemisia vulgaris*—Sheep certainly eat the leaves of this plant when young, and are uncommonly fond of its roots.

				O. G.	Sh.	H. Sw.
435	<i>Artemisia rupestris.</i>	-	-	I	O	I
436	— <i>absinthium.</i>	Common wormwood, P VIII.	-	O	I	I
437	— <i>maritima.</i>	Sea wormwood, P VIII.	-	O	I	O
438	<i>Gnaphalium dioicum.</i>	Mountain cud-weed, or cats-foot, P V.	-	O	O	I
439	— <i>sylvaticum.</i>	Upright cud-weed, B VIII.	-	O	O	I
440	— <i>uliginosum.</i>	Black-headed cud-weed, A VIII.	-	n	I	n
441	<i>Senecio vulgaris.</i>	Common groundsel, or Simpson, A V.	-	O	n	n
442	— <i>jacobæa.</i>	Common ragwort, P VII*.	-	I	O	O
443	<i>Inula pulicaria.</i>	Small fleabane, A VIII. IX.	-	I	O	O
444	— <i>dysenterica.</i>	Middle fleabane, P VIII.	-	O	O	I
445	— <i>helenium.</i>	Elecampane, P VII. VIII.	-	O	I	O
446	— <i>salicina.</i>	-	-	I	I	I
447	<i>After triplinum.</i>	Sea starwort, P VIII.	-	O	I	O
448	<i>Chrysanthemum leucanthemum.</i>	Greater daisy, ox-eye, P V.	-	O	I	O
449	<i>Anthemis cotula.</i>	Stinking May-weed, A VI. VII.	-	O	O	O
450	— <i>arvensis.</i>	Corn camomile, B VII.	-	I	n	I
451	— <i>tinctoria.</i>	Common ox-eye, P VII.	-	O	I	O
452	<i>Cnicus oleraceus.</i>	-	-	O	I	O
453	<i>Calendula officinalis.</i>	Garden Mary-gold,	-	I	O	I
454	<i>Zostera marina.</i>	Grass wrack, P	-	O	I	O
455	<i>Sparganium erectum.</i>	Great bur-reed, P VII.	-	O	n	I

* *Senecio jacobæa*—Sheep likewise eat this plant greedily when young—Cattle seldom taste it.

		O.	G.	Sh.	H.	Sw.
456	<i>Sparganium natans.</i>					
457	<i>Sagittaria sagittifolia.</i>					
458	<i>Lycopus Europæus.</i>					
459	<i>Salvia pratensis.</i>					
460	<i>Valeriana officinalis.</i>					
461	— <i>dioica.</i>					
462	— <i>locusta.</i>					
463	<i>Eriophorum polystachyon.</i>					
464	— <i>vaginatum.</i>					
465	— <i>alpinum.</i>					
466	<i>Lolium temulentum.</i>					
467	— <i>perenne.</i>					
468	<i>Potamogeton natans.</i>					
469	<i>Symphytum officinale.</i>					
470	<i>Echium vulgare.</i>					
471	<i>Androsace septentrionalis.</i>					
472	<i>Anagallis arvensis.</i>					
473	<i>Verbascum nigrum.</i>					
474	<i>Solanum dulcamara.</i>					
475	<i>Hedera helix.</i>					

* Rye-grass.—The experience of almost every farmer in Britain can evince, that sheep most readily eat this grass, when in leaf; when in stalk, it is less palatable to all animals.

			O.	G.	Sh.	H.	Sw.
496	<i>Agæa spicata.</i>	Herb Christopher, or bane berries, P V. VI.	o	i	i	o	o
497	<i>Aconitum lycoctonum.</i>	-	o	i	io	o	n
498	<i>Aquilegia vulgaris.</i>	Common columbine, P VI.	o	i	oi	o	o
499	<i>Anemone hepatica.</i>	-	o	io	i	o	o
500	— <i>pulsatilla.</i>	Pasque flower, P IV.	o	i	i	o	o
501	— <i>pratensis.</i>	-	n	n	n	o	n
502	— <i>nemorosa.</i>	Common wood anemone, P IV.	o	i	i	o	o
503	— <i>verna.</i>	-	n	n	o	o	n
504	<i>Ranunculus flammula.</i>	Lesser spiderwort, P VI.—IX.	o	o	o	o	n
505	— <i>ficaria.</i>	-	o	i	i	o	n
506	— <i>auricomus.</i>	Sweet-wood crowfoot, or goldilocks, P IV.	i	i	o	o	n
507	— <i>sceleratus.</i>	Round leaved water crowfoot, A V. VI.	o	i	o	o	n
508	— <i>acris.</i>	Upright meadow crowfoot, P VI. VII.	o	i	i	o	o
509	— <i>repens.</i>	Creeping crowfoot, or butter cups, P V.	n	i	n	o	n
510	— <i>bulbosus.</i>	Bulbous crowfoot, or butter cups, P V.	o	n	n	o	n
511	<i>Caltha palustris.</i>	Marsh marygold, P IV.	o	i	i	o	o
512	<i>Teucrium scordium.</i>	Water Germander, P VIII.	o	i	i	o	o
513	<i>Thymus serpyllum.</i>	Mother of thyme, P VII. VIII.	n	i	i	n	o
514	— <i>actinos.</i>	Wild basil, A VII. VIII.	io	o	o	i	n
515	<i>Clinopodium vulgare.</i>	Great wild basil, P VIII.	n	i	i	o	n
516	<i>Glechoma hederacea.</i>	Ground ivy, P V.	o	o	i	io	o
517	<i>Stachys sylvatica.</i>	Hedge nettle, P VII. VIII.	o	i	i	o	o
518	— <i>palustris.</i>	Clowns allheal, P VIII.	o	o	i	o	o

		O.	G.	Sh.	H.	Sw.
519	<i>Lamium album.</i>	White dead nettle, or archangel, P V.	-	-	-	-
520	— <i>purpureum.</i>	Red archangel, or dead nettle, A V.	-	-	-	-
521	— <i>amplexicaule.</i>	Great hen-bit, A VI.	-	-	-	-
522	<i>Pedicularis sylvatica.</i>	Common lousewort, P V. VI.	-	-	-	-
523	— <i>palustris.</i>	Marsh lousewort, VI.	-	-	-	-
524	— <i>sceptrum carolin.</i>	-	-	-	-	-
525	— <i>lapponica.</i>	-	-	-	-	-
526	<i>Bartsia alpina.</i>	Mountain eyebright cow wheat, P VII.	-	-	-	-
527	<i>Linnaea borealis.</i>	-	-	-	-	-
528	<i>Bidens tripartita.</i>	Trifid water hemp agrimony, A VIII. IX.	-	-	-	-
529	— <i>cernuis.</i>	Whole leaved water hemp agrimony, A VII. VIII.	-	-	-	-
530	<i>Tanacetum vulgare.</i>	Common tansy, P VII.	-	-	-	-
531	<i>Orchis morio.</i>	Female fool-stones, or orchis, P V VI.	-	-	-	-
532	— <i>conopsea.</i>	Red handed orchis, B VI.	-	-	-	-
533	— <i>latifolia.</i>	Male handed orchis, P V. VI.	-	-	-	-
534	— <i>maculata.</i>	Female handed orchis, P VI.	-	-	-	-
535	<i>Ophrys ovata.</i>	Common tway-blade, P V. VI.	-	-	-	-
536	<i>Xanthium strumarium.</i>	Lesser burdock, A VIII. IX.	-	-	-	-
537	<i>Pinus sylvestris.</i>	Scottish fir, T V.	-	-	-	-
538	— <i>abies.</i>	Common pitch fir, T	-	-	-	-
539	<i>Myrica gale.</i>	Gale, or sweet willow, T	-	-	-	-
540	<i>Taxus baccata.</i>	Yew tree, T	-	-	-	-
541	<i>Rhodiola rosea.</i>	Rosewort, P VI. VII.	-	-	-	-

542	<i>Polypodium vulgare.</i>	Common polypody, P	-	-	n	O	I	O	n	n	n	n	n	Ox.G.Sh.H.Sw
543	— <i>flex mas.</i>	Male polypody, or fern, P	-	-	O	I	O	n	n	n	n	n	n	
544	— <i>fragile.</i>	Brittle polypody, P	-	-	I	I	n	I	n	n	n	n	n	
545	<i>Carlina vulgaris.</i>	Wild carline thistle, B VI.	-	-	O	I	n	n	n	n	n	n	n	
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546	<i>Salicornea europaea.</i>	Marsk samphire, jointed glasswort, or saltwort, A VIII. IX.	-	-	O	n	O	O	n	n	n	n	n	
547	<i>Hippuris vulgaris.</i>	Mares-tail, P V.	-	-	O	I	O	O	n	n	n	n	n	
548	<i>Circaea lutetiana alpina.</i>	Enchanters nightshade, P VI. VII.	-	-	n	n	I	n	n	n	n	n	n	
549	<i>Verbena officinalis.</i>	Vervain,	-	-	O	O	I	O	n	n	n	n	n	
550	<i>Iris pseudacorus.</i>	Yellow water flower de luce, P VII.	-	-	O	I	O	O	n	n	n	n	n	
551	<i>Schoenus albus.</i>	White flowered rush grafs, P VII.	-	-	n	I	n	n	n	n	n	n	n	
552	<i>Sagina procumbens.</i>	Pearlwort, or chickweed breakstone, A VI.	-	-	n	n	n	I	n	n	n	n	n	
553	<i>Myosotis palustris.</i>	- - - - -	-	-	O	I	O	n	n	n	n	n	n	
554	<i>Hottonia palustris.</i>	Water violet, P VII. VIII.	-	-	I	n	n	n	n	n	n	n	n	
555	<i>Hyofcyamus niger.</i>	Common henbane, A VI.	-	-	O	O	I	O	n	n	n	n	n	
556	<i>Glaux maritima.</i>	Sea milkwort, or black faltwort, P VII.	-	-	I	n	n	n	n	n	n	n	n	
557	<i>Asclepias vincetoxicum.</i>	- - - - -	-	-	O	I	O	n	n	n	n	n	n	
558	<i>Gentiana amarella.</i>	Autumnal gentian, or fellwort, A VII. VIII.	-	-	n	n	I	O	n	n	n	n	n	
559	— <i>centaurium.</i>	Lefser centory, A VI.—VIII.	-	-	O	n	n	n	n	n	n	n	n	
560	<i>Tordylium anthriscus.</i>	Hedge parley, B VIII.	-	-	I	O	n	n	n	n	n	n	n	

		Ox.	G.	Sh.	H.	Sw.
561	<i>Conium maculatum.</i>					
562	<i>Ænanthe fistulosa.</i>					
563	----- <i>crocata.</i>					
564	<i>Sambucus nigra.</i>					
565	<i>Tulipa sylvestris.</i>					
566	<i>Alisma plantago.</i>					
567	<i>Chrysosplenium alternifolium.</i>					
568	<i>Adoxa moschatellina.</i>					
569	<i>Pyrola rotundifolia.</i>					
570	----- <i>secunda.</i>					
571	----- <i>uniflora.</i>					
572	<i>Ledum palustre.</i>					
573	<i>Saponaria fastigiata.</i>					
574	<i>Saxifraga granulata.</i>					
575	<i>Arenaria serpyllifolia.</i>					
576	----- <i>trinervia.</i>					
577	----- <i>peplodes.</i>					
578	----- <i>rubra.</i>					
579	<i>Afarum europæa.</i>					
580	<i>Stratiotes aloides.</i>					
581	<i>Nepeta cataria.</i>					
582	<i>Betonica officinalis.</i>					

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 Water dropwort, P VII.
 Common elder, T V. VI.
 The tulip, P VI.
 Great water plantain, P VI.
 Alternate leaved golden faxifrage, P IV.
 Tuberoſe moſchatel, P III IV.
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 Dented leaved winter green, P VI.
 Marſh ciſtus, or wild roſemary,
 White ſingreen, or faxifrage, P V.
 The leaſt chickweed, A V.
 Plantain leaved chickweed, A V.
 Sea chickweed, P VI. VII.
 Purple flowered chickweed, or ſea ſpurry, A VI.
 Aſarabacca, P V.
 Water aloe, or freſh-water ſoldier, P VI.
 Nap, or cat-mint, P VII.
 Wood betony, P VII. VIII.

				O.	G.	Sh.	H.	Sw.
583	<i>Scrophularia nodosa.</i>	Knobby rooted figwort, P VII.	-	O	I	O	O	O
584	<i>Cochlearia officinalis.</i>	Common, or garden scurvy-grafs, B IV. V.	-	I	O	O	O	O
585	----- <i>danica.</i>	Danish scurvy-grafs, B V.	-	I	O	O	O	O
586	<i>Isatis tinctoria.</i>	Woad, B VI.	-	I	O	O	O	O
587	<i>Arabis thaliana.</i>	Coted mouse-ear, A V.	-	I	O	O	O	O
588	<i>Raphanus raphanistrum.</i>	Wild charlock *	-	I	O	O	O	O
589	<i>Bunias cakile.</i>	Sea rocket, A VI.	-	I	O	O	O	O
590	<i>Eupatorium cannabinum.</i>	Hemp agrimony, or Dutch ditto, P VII.	-	I	O	O	O	O
	VIII.		-					
591	<i>Filago pyramidalis.</i>		-	O	I	O	O	O
592	----- <i>montana.</i>	The least cudweed, A VI. VII.	-	O	O	O	O	O
593	----- <i>arvensis.</i>		-	O	O	O	O	O
594	<i>Erigeron acre.</i>	Blue flowered fleabane, P. VII. VIII.	-	O	O	O	O	O
595	----- <i>uniflorum.</i>		-	O	O	O	O	O
596	<i>Impatiens noli me tangere.</i>	Quick in the hand, touch me not, A VIII.	-	O	O	O	O	O
597	<i>Satyrion viride.</i>	Frog satyrion, or orchis, P V. VI.	-	O	O	O	O	O
598	----- <i>nigrum.</i>		-	O	O	O	O	O
599	<i>Cypripedium calceolus.</i>	Ladies slipper, P VII.	-	O	O	O	O	O
600	<i>Typha angustifolia.</i>	Narrow leaved cats tail, P VII.	-	O	O	O	O	O
601	<i>Bryonia alba.</i>	White bryony, P V.	-	O	O	O	O	O
602	<i>Corylus avellana.</i>	The hazel tree, T I II.	-	O	O	O	O	O

* Raphanus—Cattle certainly eat this when green, if cut and given by hand.

		O.	G.	Sh.	H.	Sw.
603	<i>Empetrum nigrum</i> . Black-berried heath, Crow, or crack-berries, P IV.					
	V.	o	10	o	o	n
§ V.						
604	<i>Pinguicula vulgaris</i> . Butterwort, or Yorkshire fanicle, P V *.					
605	— <i>alpina</i> .	o	o	o	o	n
606	— <i>villosa</i> .	o	o	o	o	n
607	<i>Montia fontana</i> . Water chickweed, A IV.	o	n	o	o	o
608	<i>Potamogeton perfoliatum</i> . Perfoliated pond-weed, P VI. VII.	o	o	o	o	o
609	— <i>lucens</i> . Long leaved pond-weed, P VI.	o	n	o	n	n
610	— <i>crispum</i> . Greater water caltrops, P V. VI.	o	n	n	n	n
611	— <i>pectinatum</i> . Fennel leaved pond-weed, P VI.	n	o	n	n	o
612	<i>Myofotis scorpioides</i> . Moufe-ear scorpion grass, P IV.—VIII.	o	o	o	o	o
613	— <i>lappula</i> .	o	n	o	o	n
614	<i>Diapensia lapponica</i> .	o	o	o	o	n
615	<i>Datura stramonium</i> .	o	o	o	o	n
616	<i>Verbascum thapsus</i> . B VII.	o	o	o	o	o

* *Pinguicula*—This is the plant called by the vulgar *rot-grass*; it is commonly imagined, that sheep eat it greedily, and that it occasions the rot in them. I never saw it touched by any animal.

		Ox.	G.	Sh.	H.	Sw.
617	<i>Verbascum lychnitis.</i>	Hoary mullein, B VII.	-	-	-	-
618	<i>Solanum nigrum.</i>	Garden nightshade, A VI. VII.	-	-	-	-
619	<i>Salsola kali.</i>	Prickly glasswort, A VII. VIII.	-	-	-	-
620	<i>Sambucus ebulus.</i>	Dwarf elder, walwort, Danewort, T VII.	-	-	-	-
621	<i>Acorus calamus.</i>	Sweet-smelling flag, or calamus aromaticus, P V.	-	-	-	-
622	<i>Polygonum hydropiper.</i>	Water pepper, or arsmart, A VII. VIII.	-	-	-	-
623	<i>Butomus umbellatus.</i>	Flowering rush, or water gladiole, P VI.	-	-	-	-
624	<i>Dryas octopetala.</i>	Mountain avens, P. VII.	-	-	-	-
625	<i>Aconitum napellus.</i>	-	-	-	-	-
626	<i>Ranunculus aquatilis.</i>	Various leaved water crowfoot, P IV. V.	-	-	-	-
627	<i>Ballota nigra.</i>	Stinking horehound, A VII.	-	-	-	-
628	<i>Marrubium vulgare.</i>	White horehound, P VII.	-	-	-	-
629	<i>Cochlearia armarica.</i>	Horse raddish, P V.	-	-	-	-
630	<i>Dentaria bulbifera.</i>	Coralwort, P IV.	-	-	-	-
631	<i>Spartium scoparium.</i>	Common broom, T V. VI *.	-	-	-	-
632	<i>Onopordum acanthium.</i>	Cotton thistle, B VII.	-	-	-	-
633	<i>Bellis perennis.</i>	Common daisy, P III.—IX †.	-	-	-	-

* Broom—Sheep sometimes eat this in winter,—but they are greedy of the blossom, which they pick off with care —They also eat the young pods.

† Daisy—It is commonly imagined, that a field in which this plant abounds affords fine pasture; which proceeds from inaccurate observation.—The flowers are not touched, and appear beautiful—the

		O.	G.	Sh.	H.	Sw.
634	<i>Calla palustris.</i>	n	o	n	o	o
635	<i>Myriophyllum spicatum.</i> Spiked water millfoil, P VI. VII.	n	o	o	n	n
636	<i>Asplenium trichomanes.</i> Common maiden hair, P	o	n	o	n	o
637	<i>Acrosticum septentrionale.</i> Forked, or horned fern, P	n	n	n	n	o
638	<i>Chelidonium majus.</i>	o	o	o	o	o

From the above Table it appears, That

	Oxen have eat of	328	and refused 187 different plants.	Total,	515
Goats	-	470	-	-	545
Sheep	-	422	-	-	533
Horses	-	293	-	-	502
Swine	-	119	-	-	305
Total number of experiments,		-	-	-	2400

leaves remain unrotted, and appear luxuriant, without the appearance of rankness—while the other more valuable grasses are bit close to the ground.—I believe no animal eats this through choice—but, as it is small, and closely mixed with other palatable plants, it is sometimes cropt through necessity among them.

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Page 38. note, for *Poligonatum Aviculare* read *Avena elatior*
 39. l. 7. for It is read Is it

